

Introduction

TRAFFIC CONTROL SUPERVISOR AWARENESS

CHAPTER 1

INTRODUCTION

Course Scope

- Interpreting/Reading
 - Installing
 - Maintaining
 - Evaluating
-

Course Objectives

- Gain understanding
 - Apply workable concepts & techniques
 - Apply traffic control plans that are appropriate
 - Discuss techniques and procedures
-

CHAPTER 2

TRAFFIC CONTROL REGULATIONS AND RESOURCES

Regulatory Requirements

“MUTCD”

**MANUAL ON UNIFORM TRAFFIC
CONTROL DEVICES**

MUTCD PART VI

“Temporary Traffic Control”

Regulatory Requirements

STATE MODIFICATIONS TO THE MUTCD

Regulatory Requirements

QUALITY STANDARDS FOR WORK ZONE TRAFFIC CONTROL DEVICES

CHAPTER 3

FUNDAMENTAL PRINCIPLES OF TRAFFIC CONTROL

The Purpose of Traffic Control

- **Warn** motorists and pedestrians of hazards,
 - **Advise** motorists and pedestrians of the proper travel path through the area;
 - **Delineate** the path traffic should follow; and
 - **Separate** and **protect** motorists, pedestrians, and workers
-

The Fundamentals

- **Make traffic safety** an integral and **high priority** element of every project.
 - **Avoid inhibiting traffic** as much as possible
 - **Guide motorists and pedestrians in a clear and positive manner.**
-

The Fundamentals, cont...

- **Perform** routine **inspections** of traffic control elements
 - Throughout the project, **give attention to roadside safety**
 - **Flagging** procedures, when used, **should provide positive guidance** to road users
-

The Fundamentals, cont...

The goal of traffic control is to:

- **Make the work site safe**
 - **Keep traffic moving safely**
 - **Minimize liability**
 - **Meet Federal, State and Local regulations**
-

The Fundamentals, cont...

The key elements of traffic control are:

- **Give adequate warning and guidance**
 - **Keep the controls simple**
 - **Follow recognized standards**
-

Human Factors

Expectancy,

- **When expectancies are met and reinforced, performance tends to be error free,**
 - **When expectancies are violated, motorists need more time to respond, their performance may be poorer, and they may commit errors or even fail to respond.**
-

Human Factors

Motorists need more time to decide on the appropriate action when:

- **The situation is unfamiliar;**
 - **Several responses are possible;**
 - **The maneuver required is more complex, or**
 - **The driver is impaired.**
-

Human Factors, cont....

Key characteristics of effective traffic controls are:

- In “similar situations”,
 - Use “similar treatments”,
 - To get a “similar response”.
-

Human Factors, cont....

Positive Guidance:

- **Reduce the number of features** which can cause driver error.
 - **Ensure that motorists are adequately warned** of features that cannot be eliminated.
 - **Protect drivers from hazards.**
-

Human Factors, cont....

Credibility:

- **Turn, cover or remove signs that are not applicable.**
 - **Don't post unnecessarily restrictive speed limits.**
 - **Don't inform the motorist to expect a hazard that is not there.**
 - **Avoid unexpected situations because surprised drivers may react in unexpected ways.**
 - **Maintain controls as if every driver were approaching the temporary traffic control zone for the first time.**
-

Pedestrian Safety

- **Pedestrians should be provided with access and safe passage.**
 - **Drivers and pedestrians should be guided in a clear and positive manner.**
 - **Pedestrian paths through the temporary traffic control zone should be protected.**
-

Pedestrian Safety, cont....

- **Pedestrians should not be led into direct conflicts with work site vehicles, equipment or operations.**
 - **Pedestrians should not be led into direct conflicts with mainline traffic.**
 - **Pedestrians should be provided with a safe, convenient travel path. Remember the ADA.**
-

Work Zone Accidents

Causes:

- **Confront motorist with unexpected** and sometimes confusing situations.
 - **Create Obstructions** with which the motorist can collide.
 - **Divert motorists' attention** from the driving task.
 - **Expose workers** to traffic.
-

Feedback From Road Users

- **Brake applications**
 - **Tire marks**
 - **Displaced channelizing devices**
 - **Letters or phone calls**
 - **Horn blowing, gestures**
 - **Verbal Abuse**
-

Dealing with the Angry Motorist

- **Make sure workers are aware of all expected delays**
 - **Smile and be pleasant (Don't be cynical)**
 - **Apologize to the motorist for the inconvenience.**
 - **Agree with, or at least do not challenge the angry motorist**
 - **Avoid extended eye contact**
-

CHAPTER 4

TRAFFIC CONTROL SUPERVISOR AND TRAFFIC CONTROL MANAGEMENT RESPONSIBILITIES

Traffic Control Management

- **The organization performing the work has the responsibility for managing traffic control and providing safe traffic control measures that are appropriate for the type of work and consistent with the requirements of the plans and specifications.**
-

OR - Traffic Control Management

OREGON - There are two levels of Certification

Traffic Control Supervisor- is the person responsible for traffic control on the construction project. Renewal of TCS certification is required every three years.

Traffic Control Technician- A technician apprenticeship level for someone who completes the TCS training, but, does not have the one-year of experience required for the full TCS certification.

TCS certification from ATSSA, WASHINGTON TCS or other approved programs is acceptable with completion of day-two of the Oregon program.

OR - Traffic Control Management

Traffic Control Supervisor

The duties of the Traffic Control Supervisor (TCS) shall include:

1. Overseeing the project to ensure that proper safety and traffic control measures are implemented and consistent with the specific requirements.
 2. Discussing proposed traffic control measures and coordinating implementation.
 3. Coordinating all traffic control operations.
-

OR - Traffic Control Management

4. Coordinating the projects with appropriate police, fire control agencies, city or county engineering, medical emergency agencies, school districts, and transit companies.
 5. Oversee all requirements of the contract, which contribute to the convenience, safety, and orderly movement of vehicular and pedestrian traffic.
 6. Attending all project meetings where traffic management is discussed.
-

OR - Traffic Control Management

7. The TCS shall personally perform all the duties of the TCS. During non-work periods, the TCS shall report to the job site within a 45-minute time period after notification by the Engineer.
 8. Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public. Traffic control devices shall be inspected each work shift except the post mounted signs and nighttime lighting need to be checked only once a week.
-

OR - Traffic Control Management

- 9. Preparing a daily report which shall be submitted to the Engineer no later than the end of the next working day to become a part of the project records. Include in the report such items as:**
 - a. When signs and traffic control devices are installed and removed.**
 - b. Location and condition of signs and traffic control devices.**
 - c. Revisions to the approved traffic control plan (TCP).**
 - d. Lighting utilized at night, and**
 - e. Observations of traffic conditions.**
 - 10. Ensuring that corrections are made if traffic control devices are not functioning as required. The TCS may make minor revisions to the approved traffic control plan to accommodate site conditions as long as the original intent of the traffic control plan is maintained and the revision has the concurrence of the engineer.**
-

OR - Traffic Control Management

- 11. Attending traffic control coordinating meetings or coordination activities as authorized by the Engineer.**
 - 12. Ensuring that all needed traffic control devices are available and in good working condition prior to the need to install those devices.**
 - 13. Having a current set of approved TCP's and applicable contract provisions and the latest adopted edition of the MUTCD and applicable standards and specifications.**
-

OR - Traffic Control Management

Possession of a current flagging certificate by the TCS is mandatory.

Equip TCS as Follows:

- Clothing, vest, hard hat or cap equivalent to that of flaggers.**
 - Portable, self-contained two-way radio with a range suitable for the project.**
 - Cellular telephone active 24 hours a day.**
 - A vehicle that is equipped with a roof or post mounted rotating amber light that is visible for 360°, or other approved non-strobe device.**
-

WA – Traffic Control Management

- It is the Contractor's responsibility to plan, conduct and safely perform the work.
 - The Contractor shall manage temporary traffic control with their own staff. These duties may not be subcontracted.
-

WA – Traffic Control Management

- The Contractor shall also designate an individual to perform the duties of the primary Traffic Control Supervisor (TCS) and an alternate.
 - Contractor shall maintain a 24-hour phone number where the traffic control management and TCS can be contacted
-

WA – Traffic Control Management

Traffic control management's responsibilities

- Overseeing and approving the actions of the TCS to ensure proper control and safety measures have been taken
 - Providing TCP to the TCS and having a copy of the MUTCD
 - Discussing propose traffic control measures and coordinating implementation with the engineer
-

WA – Traffic Control Management

- Coordinating all traffic control operations, including those of subcontractors and supplies, with each other and with any adjacent operations
 - Coordinating the project's activities (such as closures) with appropriate public agencies
 - Overseeing all requirements of the contract which contribute to the convenience, safety, and orderly movement of vehicular and pedestrian traffic
-

WA – Traffic Control Management

- Reviewing the TCS's diaries daily and being aware of field traffic control operations
 - Being present on-site a sufficient amount of time to adequately accomplish the above-listed duties
-

WA – Traffic Control Management

- A Traffic Control Supervisor (TCS) shall be on the project whenever flagging or spotting or other traffic control labor is being utilized or less frequently, as authorized by the engineer
 - The TCS shall personally perform all the duties of the TCS. During non-work periods, the TCS shall be available to the job site within a 45-minute time period after notification by the Engineer
-

WA – Traffic Control Management

TCS's Responsibilities

- Having a current set of approved traffic control plans (TCPs), applicable contract provisions as provided by the Contractor, the latest adopted edition of the MUTCD including the Washington State Modifications to the MUTCD, the book Quality Guidelines for Work Zones Traffic Control Devices and applicable standards and specifications.
-

WA – Traffic Control Management

- **Inspecting traffic control devices and nighttime lighting. Traffic control devices shall be inspected at least once per hour during working hours except the Class A signs and nighttime lighting need to be checked only once a week. Traffic control devices left in place for 24 hours or more should be inspected once during the nonworking hours when they are initially set up (during daylight or darkness, whichever is opposite the working hours). The TCS shall correct, or arrange to have corrected, any deficiencies noted during these inspections.**
-

WA – Traffic Control Management

- **Preparing a daily traffic control diary on DOT Forms 421-040A and 421-040B this shall be submitted to the Engineer no later than the end of the next working day to become a part of the project records.**
 - **Time of day signs and traffic control devices are installed and removed.**
 - **Location and condition of signs and traffic control devices.**
 - **Revisions to the approved traffic control plan (TCP).**
 - **Lighting utilized at night, and**
 - **Observations of traffic conditions.**
-

WA – Traffic Control Management

- **Making minor revisions to the traffic control plan to accommodate site conditions provided that the original intent of the traffic control plan is maintained and the revision has the concurrence of both the Contractor and the Engineer.**
 - **Attending traffic control coordinating meetings or coordination activities as necessary for full understanding and effective performance.**
 - **Ensuring that all needed traffic control devices and equipment are available and in good working condition prior to the need to install or utilize them.**
-

WA – Traffic Control Management

- **The TCS may perform the work as Flaggers, Spotters or Other Traffic Control Labor and be compensated under those bid items, provided that the duties of the TCS are accomplished.**
 - **Possession of a current flagging card by the TCS is mandatory.**
 - **A reflective (retroreflective) vest shall be worn by the TCS.”**
 - **A TCS may be required to wear a hard hat depending on the situations and the WSDOT region.**
-

Oregon TCS Emergency Response

In Oregon the contractor must have an emergency response plan prior to starting work.

- An incident is anything that happens on the state highway, which affects normal traffic flow and poses a hazard to the public. For the TCS the focus would be an incident in a construction work zone.**
 - Examples of construction conditions where there may be a potential for incidents: Crossovers, lane closures, hills and mountains, bridgework, narrow lanes.**
 - Incidents in these areas may be: A disabled vehicle, debris on the roadway, spilled cargo or material, or vehicle accident.**
 - Prompt response to protect the safety of the public is required.**
-

Oregon TCS Emergency Response, Cont'd

ODOT Communications Centers

- **Portland- Traffic Management Operations Center** (TMOC). Serves urban areas of Region 1. Located at Region 1 headquarters. Call sign: Station 1
 - **Salem- Region 2 Communications Center**. Serves Region 2, Motor Carrier Ports of Entry. Located at OSP Western Regional Dispatch Center, Salem. Call Sign: Station 2.
 - **Medford- Region 3 Communications Center**. Serves Region 3. Located at OSP Southern Regional Dispatch Center. Call Sign: Station 3
 - **Bend-Region 4 Communications Center**. Services Region 4 and 5. Located at OSP Eastern Regional Dispatch Center. Call sign: Station 4
-

CHAPTER 5

TRAFFIC CONTROL DEVICES

Principles of Traffic Control Devices

- **Fulfill a need**
 - **Command attention**
 - **Convey a clear simple meaning**
 - **Command respect of road users**
 - **Give adequate time for proper response**
-

Conformance to Established Standards

- “The National Cooperative Highway Research Project (NCHRP) Report 350, establishes requirements for crash testing.”
 - Workzone devices are divided into **four categories:**
-

Work Zone Device Categories

- **Category 1**: cones, tubular markers, flexible delineator posts, and plastic drums with no attachments.
-

Work Zone Device Categories, cont...

- **Category 2:** barricades, portable sign supports and signs, intrusion alarms and vertical panels.

Note: includes devices that are not expected to produce significant vehicular velocity change, but may otherwise be hazardous

Work Zone Device Categories, cont....

- **Category 3:** barriers, fixed sign supports, crash cushions, truck mounted attenuators (TMA's) and other work zone devices not meeting the definition of Category 1 or 2

Note: Includes hardware expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles.

Work Zone Device Categories, cont....

- **Category 4:** arrow displays, lighting supports, and portable changeable message signs (PCMS's).

Conditions of Traffic Control Devices

Washington State

- **“The condition of signs and traffic control devices shall be 'acceptable' or 'marginal' as defined in the book Quality Standards for Work Zone Traffic Control Devices, and will be accepted based on a visual inspection by the Engineer. The Engineer's decision on the condition of a sign or traffic control device shall be final. When a sign or traffic control device becomes classified as 'unacceptable' it shall be removed from the project and replaced within 12 hours.”**
-

Conditions of Traffic Control Devices

Oregon

- The condition of signs and traffic control devices shall be new, like new or “acceptable” as defined in the book Quality Standards for Work Zone Traffic Control Devices, and will be accepted based on a visual inspection by the Engineer. When a sign or traffic control device becomes classified as “marginal” or “unacceptable”, it shall be removed from the project, within a time period agreed upon by the Engineer.
-





RIGHT LANE
CLOSED
1/2 MILE



Signs

Signs Should:

- Warn
- Advise
- Instruct

**The motorist on how to drive
through the work site.**

Signs, cont...

Choosing Signs

- Standard signs and messages, **as shown in the MUTCD**, shall be used

MUTCD 2003

- **“Because of their importance, advance warning signs for high-speed locations shall have a size of 48 inches x 48 inches”**
 - **“All signs used at night shall be either retroreflectorized or illuminated”**
-

Signs, cont....

Positioning of Signs

- **Locate signs where they are easily seen.**
 - **Place signs so drivers have time to respond.**
-

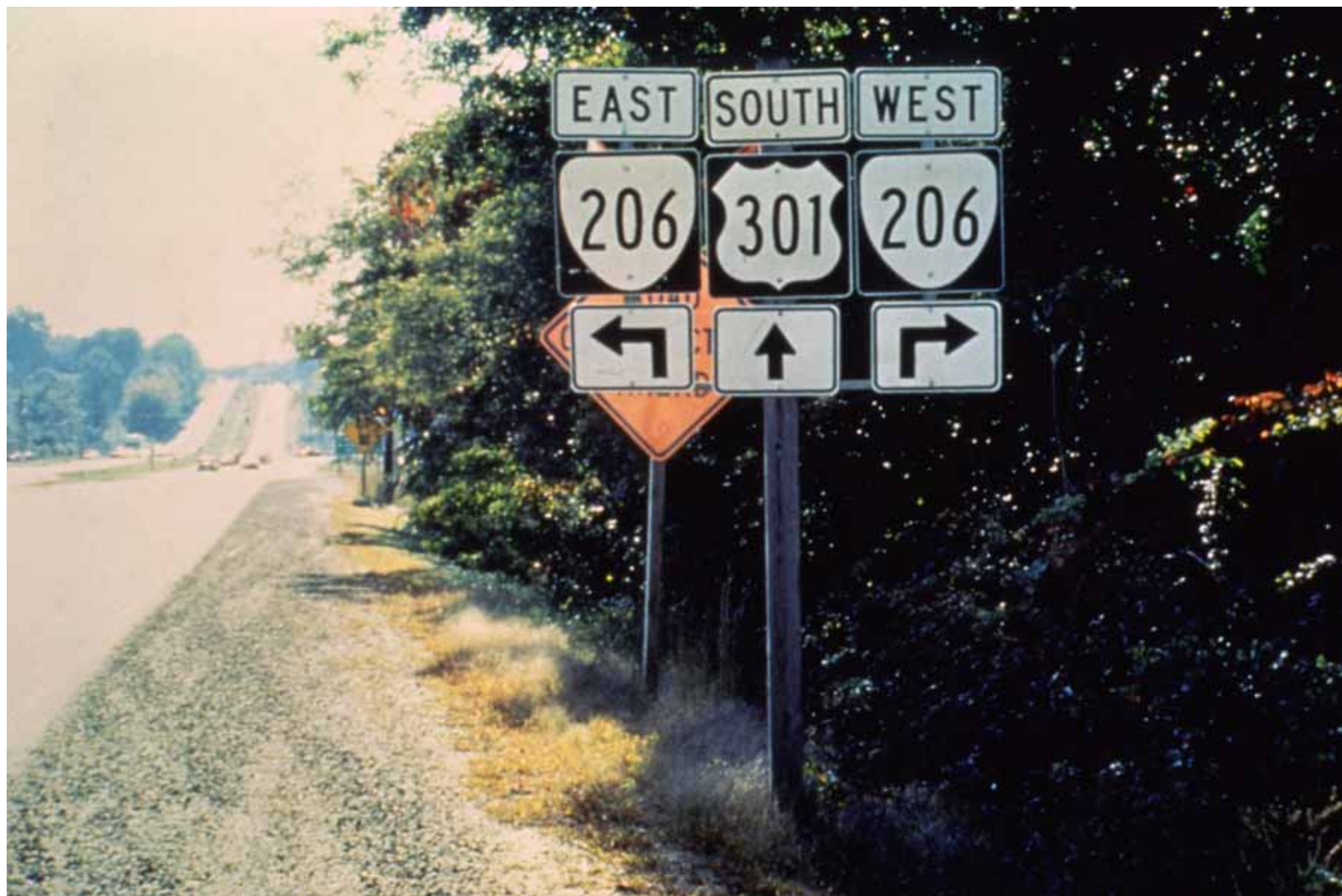




Signs, cont....

Positioning of Signs, cont...

- **As a general rule, place signs on the right-hand side of the roadway.**
 - **Where special emphasis is needed, signs may be placed on both the left and right side of the roadway.**
-







Signs, cont....

Mounting Signs

■ Washington

- Post mounted signs shall be mounted at a height of
 - 5 feet in rural areas
 - 7 feet in urban areas

■ Oregon

- Post mounted signs shall be mounted at a height of : 7 feet in all areas
-

Signs, cont....

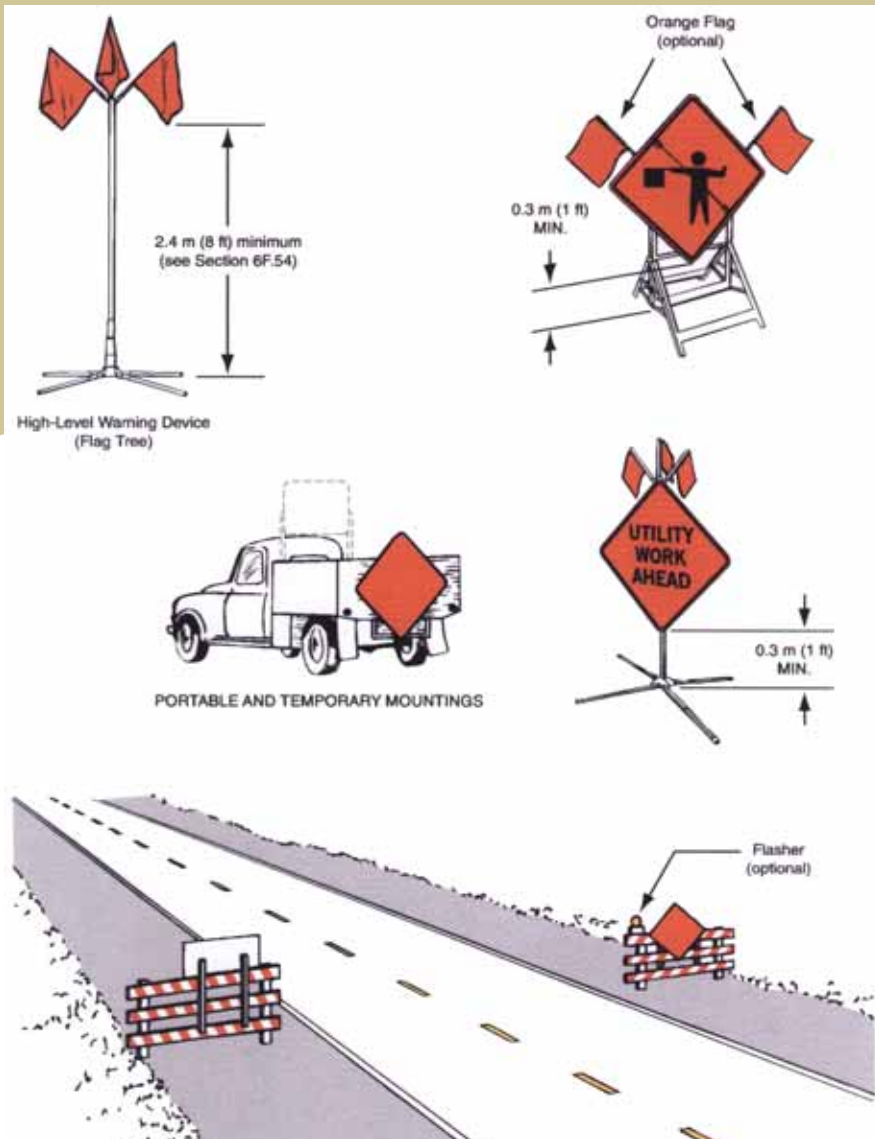
Mounting Signs cont....

- **In Washington - “Signs mounted on barricades, or other portable supports, shall be no less than 1 foot above the traveled way.”**
 - **In Oregon – No signs on barricades nor lights on barricades/signs**
-

Signs, cont....

MUTCD

Figure 6F-2 Methods of Mounting Signs Other Than on Post



Signs, cont....

Types of Signs

- **Regulatory Signs:** advise drivers of applicable laws and regulations.



Signs, cont....

Types of Signs cont....

- **Warning Signs:** give notice of general or specific conditions.



Signs, cont....

Types of signs cont....

- **Guide Signs**: show destination, designation, directions, distance, services, points of interest, and other geographical or cultural information.



Signs, cont....

Construction Signs

- Class A: mounted on posts, semi-permanent.
 - Class B: placed and removed daily.
-

Signs, cont....

Indoor Storage (preferred method)

- **Store signs on edge.**
 - **May be packaged if kept dry.**
 - **If wet, unpack immediately.**
-

Signs, cont....

Outdoor Storage (not recommended)

- **Remove all packaging materials.**
 - **Do not lay signs flat.**
 - **Store signs upright on edge.**
 - **Provide space between signs.**
 - **Avoid contact with treated posts.**
 - **Avoid storing signs where dirt and water may be splashed on them.**
-

Portable Changeable Message Signs

- 1. Recommended for high speed, high volume roadways.**
 - 2. Shall not be used to replace required signs.**
 - 3. In advance of other temporary traffic control zone signing.**
 - 4. On the shoulder of the roadway.**
 - 5. Delineated with retroreflective temporary traffic control devices.**
-

Portable Changeable Message Signs cont....

- 6. When within the clear zone, shielded with a barrier or crash cushion.**
 - 7. Removed when not in use.**
 - 8. Visible for 1/2 mile.**
 - 9. Legible for at least 650 feet.**
 - 10. Read twice at posted speed.**
-

Portable Changeable Message Signs cont....

11. Messages should be designed to take into account:

- Each phrase should convey a single thought**
 - If message can be displayed in one phrase, the top line should present the problem, center line present distance ahead and bottom line should present recommended actions**
 - Message should be brief as possible**
 - When a message is longer than two phrases, additional PCMS should be used**
 - When abbreviations are used, they should be easily understood.**
-

Portable Changeable Message Signs cont....

12. Minimum of 7 feet above roadway.

13. Automatically adjust light source.

14. Shall not scroll horizontally or vertically.

Portable Changeable Message Signs

- **Primary purpose – Advise road users of unexpected situations:**
 - **Traffic speed expected to drop substantially**
 - **Significant queuing and delays are expected**
 - **Adverse environmental conditions are present**
 - **Changes in alignment or surface conditions**
 - **Advance notice of ramp, lane or roadway closure**
 - **Emergency incident management**
 - **When changes in the road user pattern occur**
-







Arrow Panels

The arrow panel has the following possible mode selections:

- **Flashing arrow**
 - **Sequential arrow**
 - **Sequential chevron**
 - **Flashing double arrow**
 - **Flashing caution**
-

Arrow Panels, cont....

- 1. Strongly recommended for all closures of multi-lane roads. (Required in both Washington; and Oregon for 45 mph and above)**
 - 2. On the shoulder of roadway.**
 - 3. Delineated with retroreflective temporary traffic control devices.**
 - 4. When within the clear zone, shield with a barrier or crash cushion .**
 - 5. Removed when not in use.**
-











Arrow Panels, cont....

- 6. Shall not be used to laterally shift traffic.**
 - 7. Shall not be used on a two-lane, two-way roadway.**
 - 8. Do not use arrow display for shoulder closures.**
 - 9. Use caution mode for shoulder closures. (*Only four-corner caution mode allowed in Washington – Oregon allows horizontal warning*)**
-

Arrow Panels, cont....

- 10. One arrow display per lane being closed.**
 - 11. Capable of a minimum 50% dimming.**
 - 12. Located on the shoulder.**
 - 13. Visible for 1/2 mile.**
 - ODOT requires that a type III barricade be placed either 20' or 40' in front of the arrow board, depending on speed.**
 - 20' at 40 mph or less**
 - 40' at 45 mph and higher**
-

Figure 6F-6. Advance Warning Arrow Display Specifications

Operating Mode	Panel Display (Type C panel illustrated)
I. At least one of the three following modes shall be provided:	(Right arrow shown; left is similar)
Flashing Arrow	 <p data-bbox="1174 289 1402 318">Move/Merge Right</p>
Sequential Arrow	   <p data-bbox="1174 446 1402 475">Move/Merge Right</p>
Sequential Chevron	   <p data-bbox="1174 604 1402 632">Move/Merge Right</p>
II. The following mode shall be provided: Flashing Double Arrow	 <p data-bbox="1136 746 1441 775">Move/Merge Right or Left</p>
III. The following mode shall be provided: Flashing Caution	 <p data-bbox="1116 896 1209 918">Caution</p> <p data-bbox="1271 846 1300 861">or</p>  <p data-bbox="1367 896 1460 918">Caution</p>

Panel Type	Minimum Size	Minimum Legibility Distance	Minimum Number of Elements
A	1200 x 600 mm (48 x 24 in)	0.8 km (1/2 mi)	12
B	1500 x 750 mm (60 x 30 in)	1.2 km (3/4 mi)	13
C	2400 x 1200 mm (96 x 48 in)	1.6 km (1 mi)	15
D	None*	0.8 km (1/2 mi)	12

*Length of arrow equals 1200 mm (48 in), width of arrowhead equals 600 mm (24 in)















Channelizing Devices

Channelizing devices guide the motorist.

They serve the following purposes:

- **As a taper to move traffic from one lane to another,**
 - **To reduce the width of the traveled way,**
 - **To delineate and guide the driver to and along a safe path,**
 - **To separate traffic from the work space, pavement drop-offs, pedestrian paths, or opposing directions of traffic,**
 - **To mark or provide warning of hazards**
-

Channelizing Devices, cont....

Cones and Tubular Markers:

- **Minimum height is 18 inches on low-speed roadways.**
 - **28 inches for freeways and other high-speed roadways and during hours of darkness.
(Required in freeway projects in WA & OR)**
 - **For nighttime use, cones and tubes shall be retroreflectORIZED.**
-

Channelizing Devices, cont....

Drums

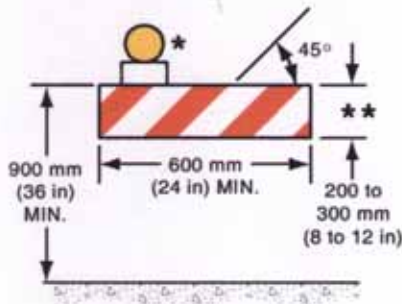
- **Lightweight, flexible.**
 - **Minimum of 36 inches high and minimum of 18 inches wide.**
 - **Stripes 4 inches to 6 inches wide and retroreflective.**
 - **Two orange and two white horizontal stripes.**
 - **Closed tops.**
 - **Metal drums shall not be used.**
 - **Ballast shall not be placed on top of drum.**
-

Channelizing Devices, cont....

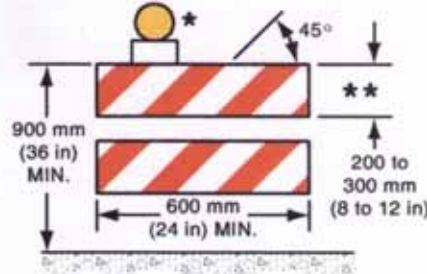
Barricades

- **Type I and II barricades are intended for situations where traffic is maintained through the work area.**
 - **Type III barricades are generally used to close a road.**
 - **Stripes on barricades shall slope downward at a 45 degree angle in the direction traffic is to pass.**
-

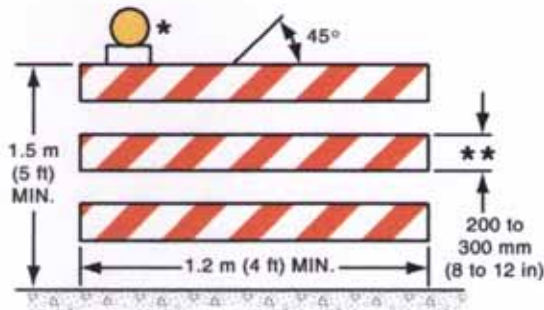
Channelizing Devices, cont....



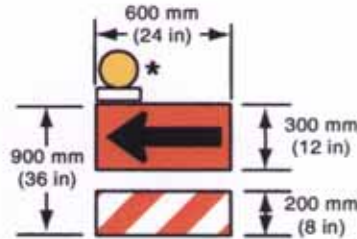
TYPE I BARRICADE ***



TYPE II BARRICADE ***



TYPE III BARRICADE ***



DIRECTION INDICATOR BARRICADE

* Warning lights (optional)

** Nominal lumber dimensions are satisfactory for barricade rail width dimensions.

*** Rail stripe widths shall be 150 mm (6 in), except that 100 mm (4 in) wide stripes may be used if rail lengths are less than 900 mm (36 in).

The sides of barricades facing traffic shall have retroreflective rail faces.

MUTCD

*Figure 6F-4.
Channelizing
Devices*

Portable Barriers

There are four primary functions of barriers:

- **Keep traffic from entering work space.**
 - **Provide protection for workers.**
 - **Separate two-way traffic.**
 - **Protect construction.**
-

Portable Barriers, cont....

Concrete Barriers

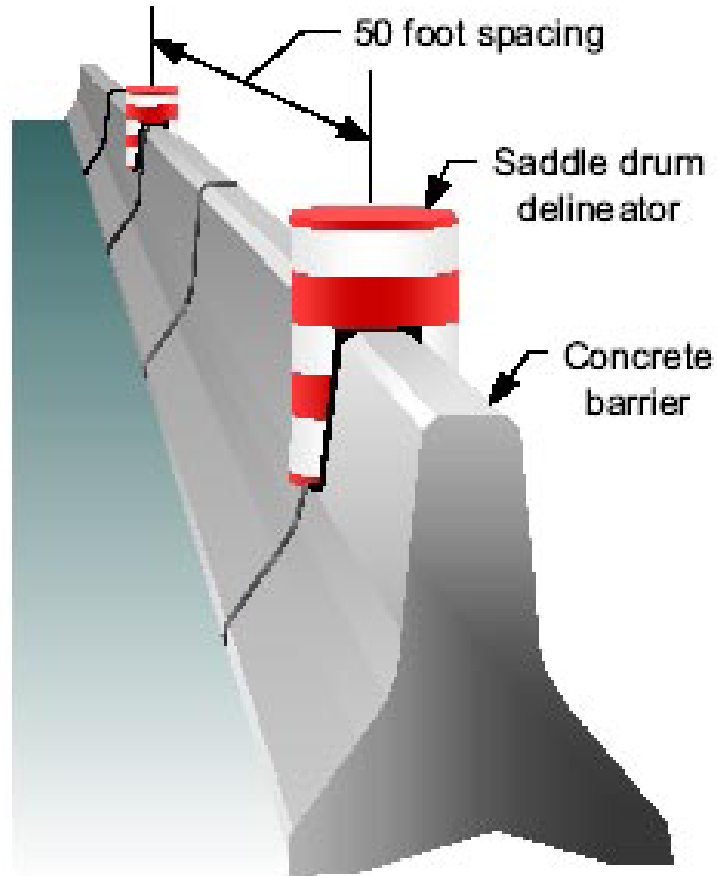
Consider the following for use of concrete barriers:

- **Where there is a high potential for injury to workers**
 - **Long term, stationary jobs**
 - **Areas of high exposure to workers and motorist**
-





Portable Barriers, cont...



Saddle Drum Delineators

Barrier Drum Delineator - WA

- Where required barrier drums shall be placed on temporary concrete barriers as the following approximate spacing:

Barrier Placement	Barrier Drum Spacing in Feet
Tangents $\frac{1}{2}$ mile or less *	2 times the posted speed limit
Tangents greater than $\frac{1}{2}$ mile *	4 times the posted speed limit
Taper and Curves **	Posted speed limit

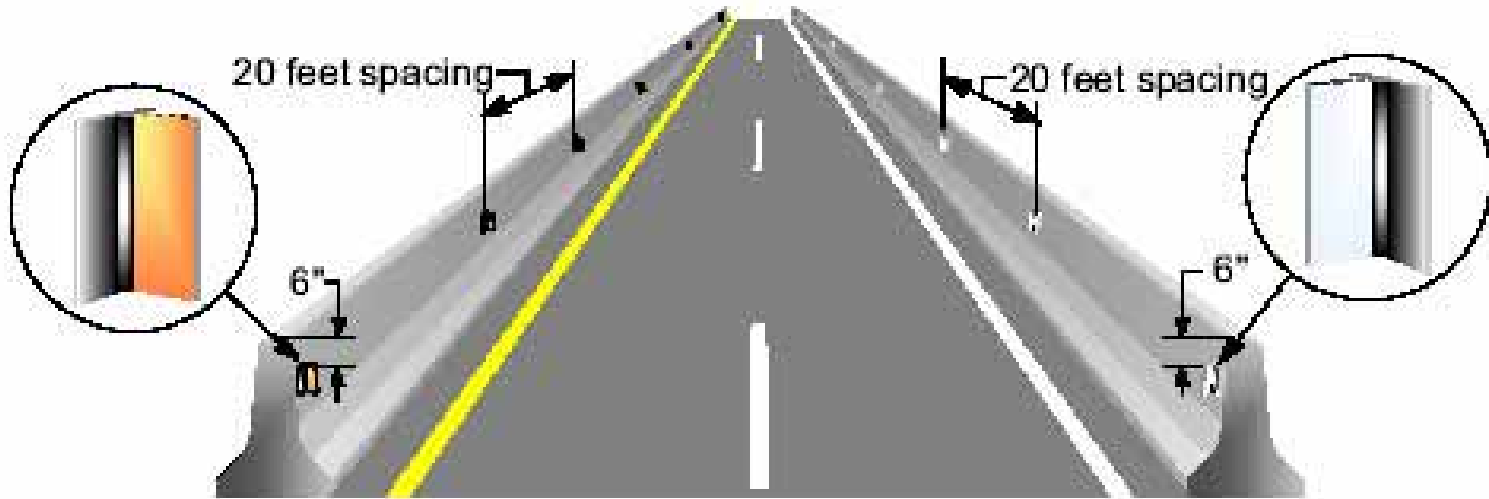
* A minimum of 3 barrier drums shall be used.

** A minimum of 5 barrier drums shall be used.

Barrier Drum Delineator - WA

- Both legs shall be completely filled with sand. The top oval should not be filled.
 - Used barrier drums may be used, provided all barrier drums used are of essentially the same configuration. They shall also be regularly maintained to ensure that they are clean and that the drums and reflective material are in good condition.
-

Portable Barriers, cont...



Concrete Barrier Delineators

Note: Color of delineator matches color of adjacent edge line.

Barrier Delineators
Figure 810-5

Portable Barriers, cont....

Water Filled Barriers

- **Not intended as a replacement for concrete barriers**
 - **CAUTION: Lateral deflection space of up to 23 feet can be required.**
 - **Follow the manufacturers specifications and recommendations**
 - **Ensure approach ends are crash worthy**
 - **Two different systems (Triton and Guardian) have been tested and approved for ODOT/WSDOT use.**
-



Work Vehicles

Work Zone Vehicles:

- **Must be equipped with an approved warning beacon.**
 - **Consider location of workers in relation to the work vehicles.**
-

Work Vehicles, cont....

Protection Vehicle:

- **Strategically placed in advance of the work area, between the buffer space and the roll ahead space, to protect workers.**
 - **A Truck Mounted Attenuator (TMA) on this vehicle is recommended.**
-



Work Vehicles, cont....

Shadow Vehicle:

- **Similar to a protective vehicle but usually a moving vehicle (mobile work zones).**
 - **A sequential arrow or truck mounted PCMS may also be used on the shadow vehicle.**
-

Impact Attenuators

Mitigate the effects of errant vehicles that strike hazards.

Two types of impact attenuators used in temporary traffic control zones are:

- **Roadside Attenuator**
 - **Truck Mounted Attenuator (TMA)**
-





Impact Attenuators, cont....

Truck-Mounted Attenuators (TMA)

Consider the following for determining TMA use:

- 1. Speed of traffic**
 - 2. Type of activity**
 - 3. Duration of project**
 - 4. Roadway environment**
-

Impact Attenuators, cont....

Truck Mounted Attenuators (TMA), cont.

- 5. Traffic volumes**
- 6. Exposure to special hazards**
- 7. Location of work area**
- 8. Roll ahead distances**

NOTE – In Oregon the engineer will determine if construction must have TMA



TM-30











Pavement Markings

(not applicable for short-term, mobile, or incident management temporary traffic control zone.)

Factors applied to the use of Pavement Markings include:

- 1. Shall be maintained for all long - and intermediate - term stationary temporary traffic control zones.**
 - 2. Shall match the markings in place at both ends.**
 - 3. Shall be placed along the entire length prior to the detour or roadway being opened.**
-

Pavement Markings, cont....

- 4. Shall be carefully reviewed during daytime and nighttime.**
 - 5. Should be comparable to the pavement markings normally used.**
-











Removal of Pavement Markings

- Pavement marking obliteration shall leave a minimum of pavement scars and shall remove old marking material.
 - Painting over existing pavement markings with black paint or spraying with asphalt shall not be acceptable as a substitute for removal or obliteration.
 - Removable, non-reflective, preformed tape may be used where markings need to be covered temporarily.
-









Lighting

Three types of lighting devices:

- **Floodlights**
 - **Steady-burning electric lamps**
 - **Warning lights**
-

Lighting, cont....

Floodlights:

- Flagging stations should be illuminated with flood lights.
 - Floodlights should be used to illuminate areas where existing light is not adequate.
 - Floodlighting shall not produce a disabling glare.
 - The driver's path past the work area should also be illuminated.
-



Lighting, cont....

Warning Lights:

- **Type A** - **low - intensity**, intended to warn drivers that they are approaching or in a hazardous area.
- **Type B** - **high - intensity**, designed to operate 24 hours per day.
- **Type C** - **steady-burning**, used to delineate the edge of the traveled way.

Flashing lights are not to be used for delineating the travel path of vehicles.

Supplemental Devices

- **Traffic Control Signals**
 - **Rumble Strips**
 - **Screens**
 - **Fencing**
-





CHAPTER 6

ELEMENTS OF TRAFFIC CONTROL PLANS

Temporary Traffic Control Zone

Most work zones can be divided into the following four areas:

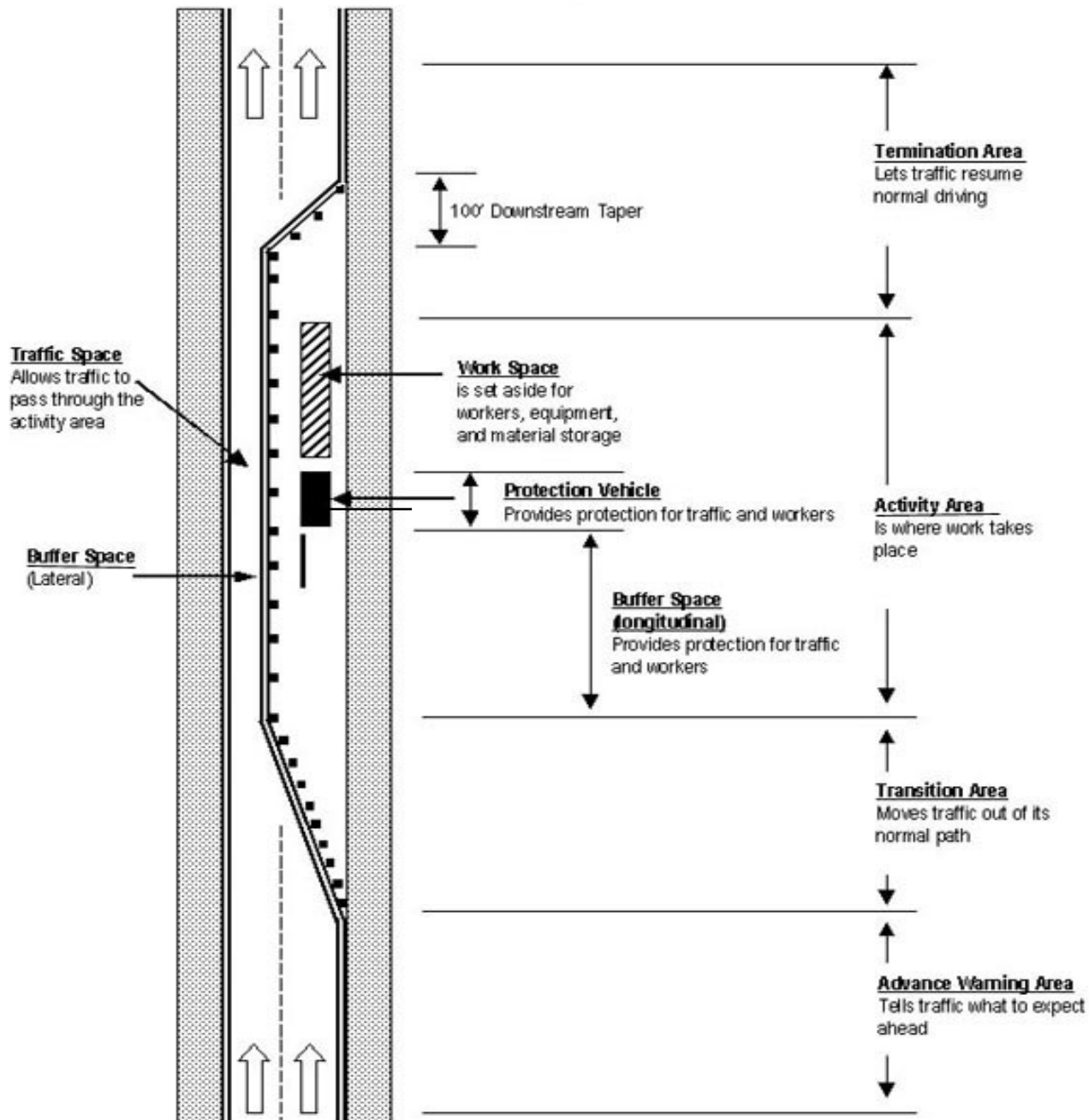
- **Advanced Warning Area**
 - **Transition Area**
 - **Activity Area**
 - **Termination Area**
-

Temporary Traffic Control Zone, cont....

The Activity Area can be further divided into:

- **Work Space**
 - **Traffic Space**
 - **Buffer Space**
-

Figure 6C-1, MUTCD 2000
Component parts of a temporary traffic control zone



Advanced Warning Area

The advanced warning area **alerts the motorist to an unexpected situation and informs him/her of what to expect.**

Drivers must have enough time to read and comprehend the messages contained on advanced warning signs and be given enough time to react to these messages

Advanced Warning Area, cont...

Warning Sign Series:

- **First sign** - attracts the motorist's attention.
 - **Second sign** - provides more detailed information
 - **Third sign** - advises the motorist of the specific action to be taken
-

Advanced Warning Area, cont....

Typical Sign Series:

Two-lane, Two-way rural highway with high operating speeds

- **ROAD WORK AHEAD**
 - **ONE LANE ROAD AHEAD**
 - **FLAGGER AHEAD (or symbol)**
-

Advanced Warning Area, con....

Typical Sign Series:

High-Speed, Multi-Lane with closure of the right lane.

- **ROAD WORK AHEAD**
 - **RIGHT LANE CLOSED AHEAD**
 - **TRANSITION SYMBOL**
-

Advanced Warning Area, cont....

Suggested Sign Spacing

Far enough apart so:

- **Driver can read the sign,**
 - **Understand the message, and**
 - **Take appropriate action,**
 - **Drivers should have 3 to 10 seconds to respond.**
-

Advanced Warning Area, cont....

**2003 MUTCD
Used in Oregon**

Road Type	Distance Between Signs		
	A	B	C
Urban (low speed)*	100' / 30m	100' / 30m	100' / 30m
Urban (high speed)*	350' / 100m	350' / 100m	350' / 100m
Rural	500' / 150m	500' / 150m	500' / 150m
Expressway Freeway	1,000' / 300m	1,500' / 450m	2,640' / 800m

*** Speed category to be determined by highway agency**

Advanced Warning Area, cont....

WAC 468-95-315, WSDOT Amendments to the MUTCD

Road Type	Speed	Distance Between Signs			
		A	B	B	C
Freeways & Expressways	55/70 mph	1500'	1500'	1500'	1500'
		(or per MUTCD)			
Rural Highways	60/65 mph	800'	800'	800'	800'
Rural Roads	45/55 mph	500'	500'	500'	500'
Rural Roads & Urban Arterials	35/40 mph	350'	350'	350'	350'
Rural Roads, Urban Streets, Residential Business Districts	25/30 mph	200'	200'	200'	200'
		(see note 2)			
Urban Streets	25 mph or less	100'	100'	100'	100'

(1) All spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.

(2) This spacing may be reduced in urban areas to fit roadway conditions.

Advanced Warning Area, cont....

WAC 296-155-305, L&I Rules, required when Flaggers are present!

Road Type	Speed	Distance Between Signs*			
		A**	B**	C**	D**
Freeway & Expressway	70/55	1500' +/-	1500' +/-	1500' +/-	1500' +/-
Rural Highways	65/60	1000' +/-	1000' +/-	1000' +/-	1000' +/-
Rural Roads	55/45	500' +/-	500' +/-	500' +/-	500' +/-
Rural Roads & Urban Arterials	40/35	350' +/-	350' +/-	350' +/-	
Rural Roads, Urban Streets Residential Business Dist.	30/25	200'***	200'***	200'***	
Urban Streets	25 or less	100'***	100'***	100'***	

* All spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways

** This refers to the distance between advance warning signs

*** This spacing may be reduced in urban areas to fit roadway conditions

Advanced Warning Area, cont....

Special Considerations for Advanced Warning Areas:

- **Urban locations**
 - **On-street parking**
 - **Commercial establishments**
 - **Rural open highways**
 - **Divided highways and one-way street with two or more lanes**
 - **Existing signs**
-

Transition Area

The Transition Area channelizes vehicles safely around the work area.

(MUTCD)

“When redirection of the road users’ normal path is required, they **shall** be channelized from the normal path.”

Transition Area, cont....

Roadway Tapers

Five types of tapers:

- Merging taper
 - Shifting taper
 - Shoulder taper
 - One-lane, two-way traffic taper
 - Downstream taper
-

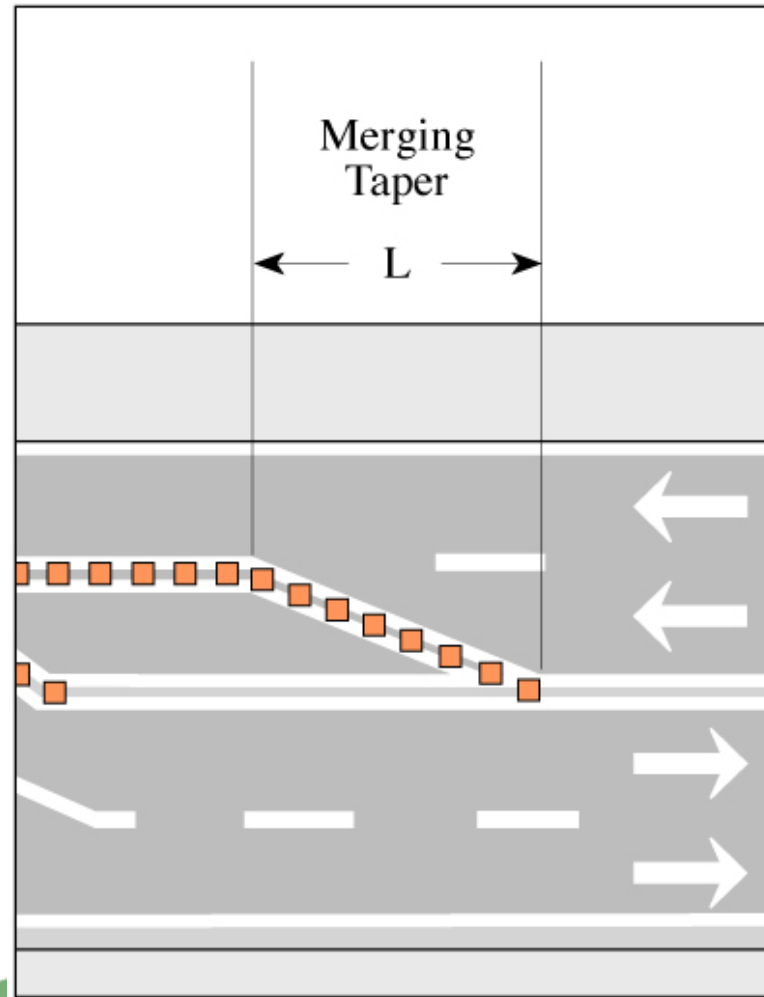
Transition Area, cont....

Merging Taper = L minimum

Used to move traffic laterally from its normal lane to merge with an adjacent lane of traffic.

Transition Area, cont....

Merging Taper



Transition Area, cont....

Taper Length Formulas:

For speeds of **45 mph or greater**

$$L = W \times S$$

L = the length of the taper in feet

W = the width of the offset

S = the posted speed

Transition Area, cont....

Taper Length Formulas:

For speeds of **40 mph or less**

$$L = \frac{W \times S^2}{60}$$

L = the length of the taper in feet

W = the width of the offset

S = the posted speed

Transition Area, cont....

Finding "L" (Merging Taper)												
S P E E D M P H	OFFSET/LANE WIDTH											
		2	3	4	5	6	7	8	9	10	11	12
	20	15	20	30	35	40	50	55	60	70	75	80
	25	25	35	45	55	65	75	85	95	105	115	125
	30	30	45	60	75	90	105	120	135	150	165	180
	35	45	65	85	105	125	145	165	185	205	225	245
	40	55	80	110	135	160	190	215	240	270	295	320
	45	90	135	180	225	270	315	360	405	450	495	540
	50	100	150	200	250	300	350	400	450	500	550	600
	55	110	165	220	275	330	385	440	495	550	605	660
	60	120	180	240	300	360	420	480	540	600	660	720
	65	130	195	260	325	390	455	520	585	650	715	780
	70	140	210	280	350	420	490	560	630	700	770	840

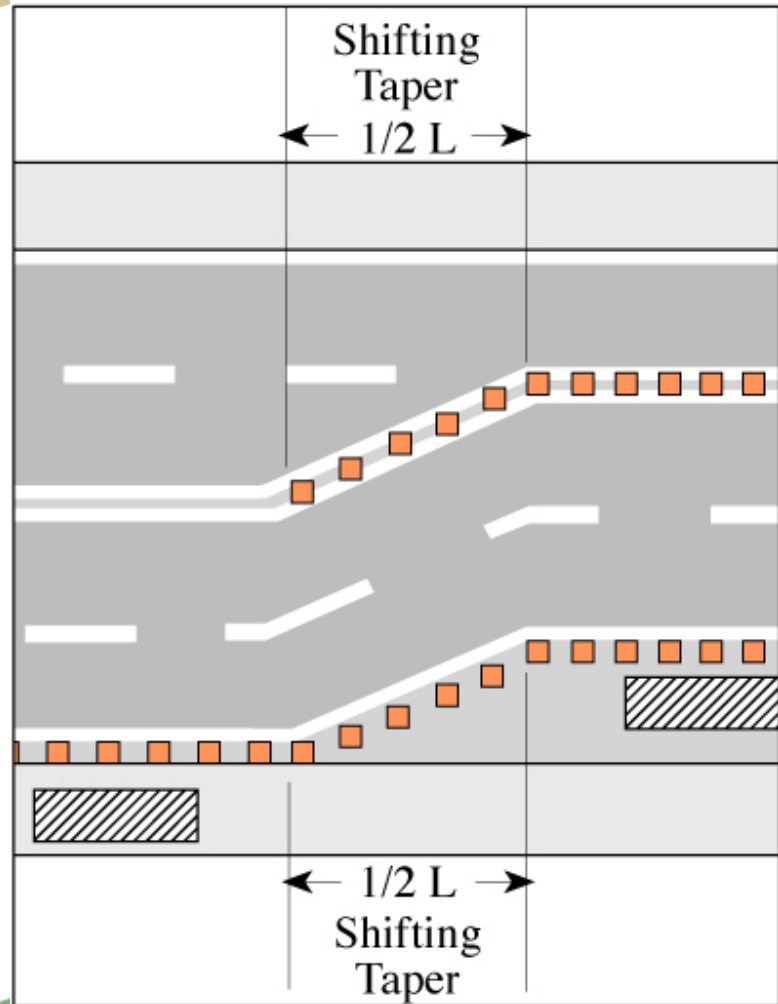
Transition Area, cont....

Shifting Taper = $1/2 L$ minimum

Used when traffic is moved laterally into a different travel path but the number of through lanes is not reduced.

Transition Area, cont....

Shifting Taper



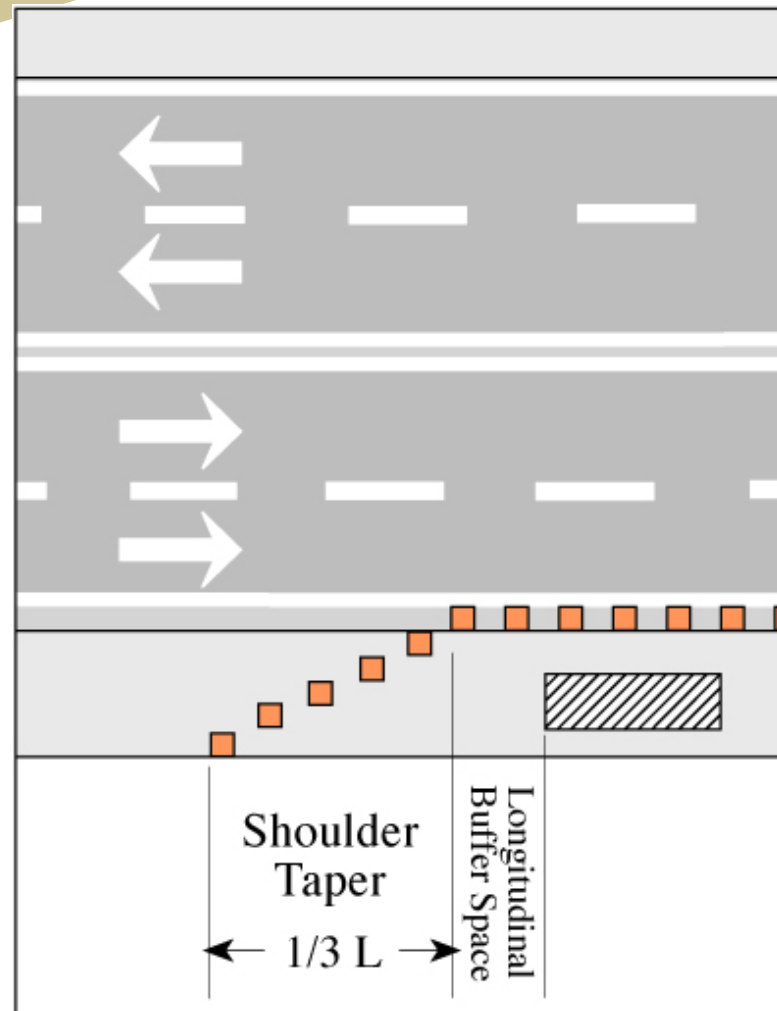
Transition Area, cont....

Shoulder Taper = $\frac{1}{3}$ L Minimum

Used when work activities on an improved shoulder require the temporary closure of the shoulder.

Transition Area, cont....

Shoulder Taper

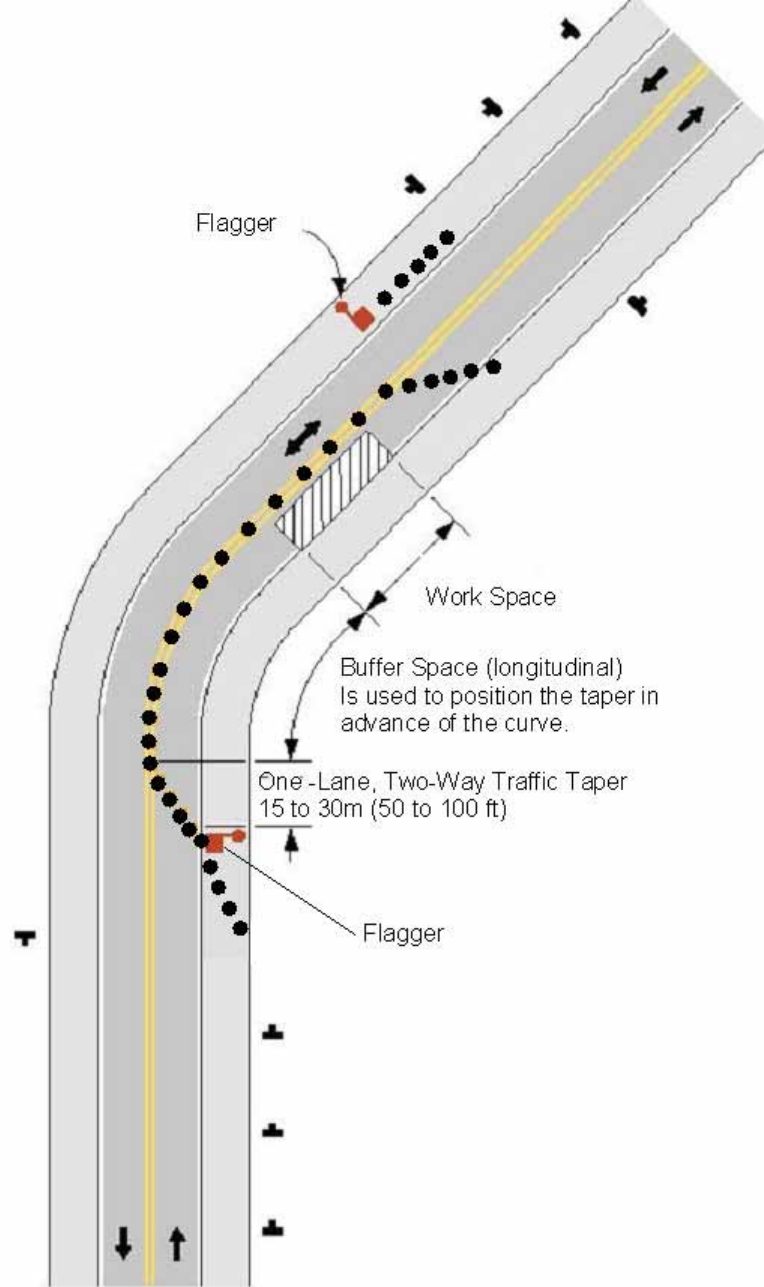


Transition Area, cont....

One-Lane, Two-Way Traffic Taper - 100 feet Maximum

Used in advance of an activity area on a two-lane roadway where a portion of the road must be closed in such a way that the remaining roadway must alternately accommodate traffic in both directions.

Transition Area, cont....

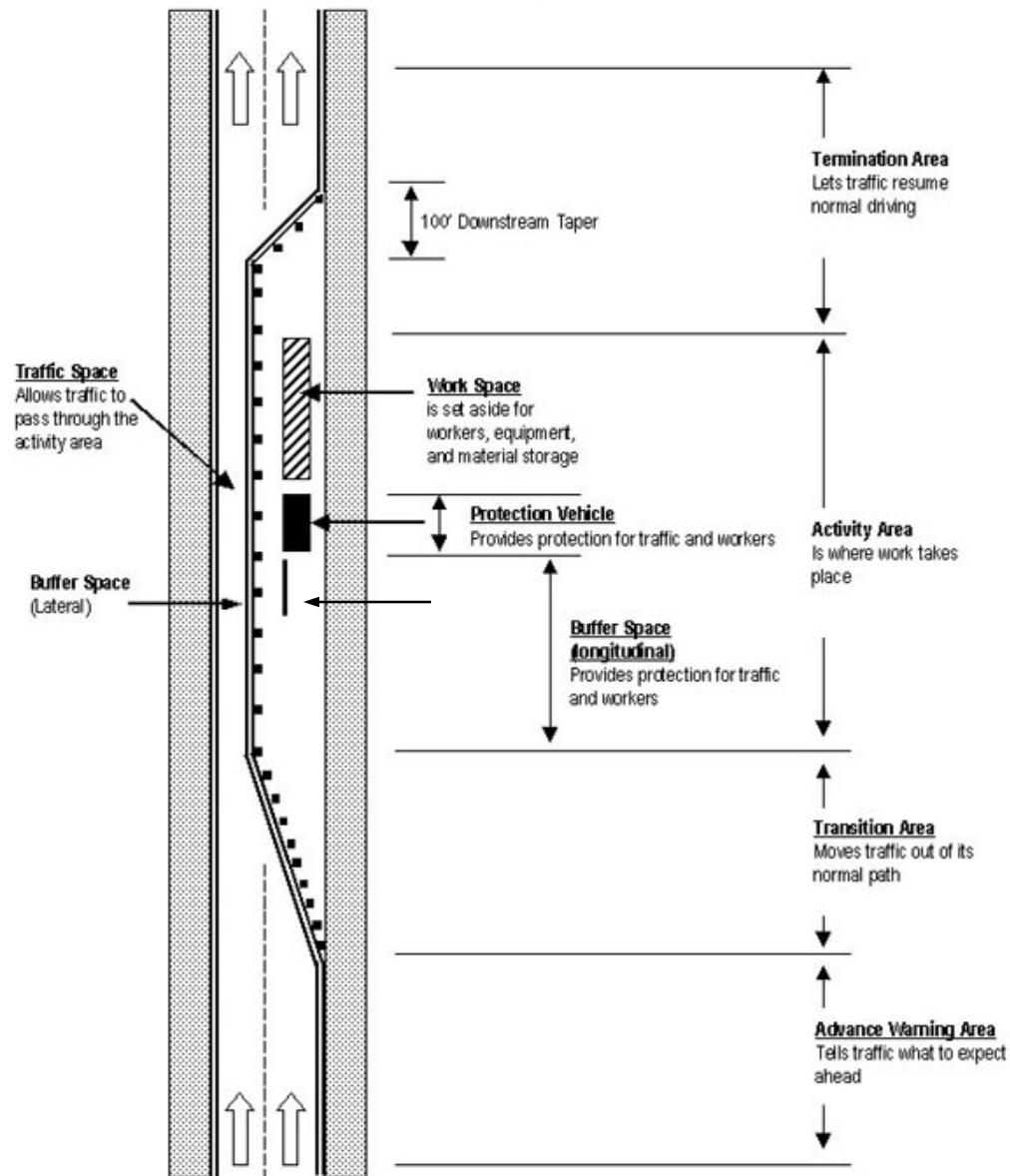


Activity Area

Area of the roadway in which the actual work takes place. It is made up of the following three elements:

- **Buffer Space**
 - **Traffic Space**
 - **Work Space**
-

Figure 6C-1, MUTCD 2000
Component parts of a temporary traffic control zone



Activity Area, cont...

BUFFER DATA										
BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (FT)	55	85	120	170	220	280	335	415	485	585
PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R*										
VEHICLE TYPE	TYPICAL VEHICLE LOADED WEIGHT (LBS)			POSTED SPEED (MPH)		STATIONARY OPERATION (FT)		*VALUES MAY BE REDUCED IN ACCORDANCE WITH TMA USE. SEE PAGE 5		
4 YARD DUMP TRUCK	24,000			60-70		100				
				50-55		75				
				45		50				
2 TON CARGO TRUCK	15,000			60-70		150				
				50-55		100				
				45		75				
1 TON CARGO TRUCK	10,000			60-70		200				
				50-55		150				
				45		100				
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT										
TMA – RECOMMENDED, SEE TABLE FOR APPLICATION PRIORITIES, PAGE 5-15										

Table 6C-2. Stopping Sight Distance as a Function of Speed

Speed* (km/h)	Distance (m)	Speed* (mph)	Distance (ft)
30	35	20	115
40	50	25	155
50	65	30	200
60	85	35	250
70	105	40	305
80	130	45	360
90	160	50	425
100	185	55	495
110	220	60	570
120	250	65	645
		70	730
		75	820

Activity Area, cont....

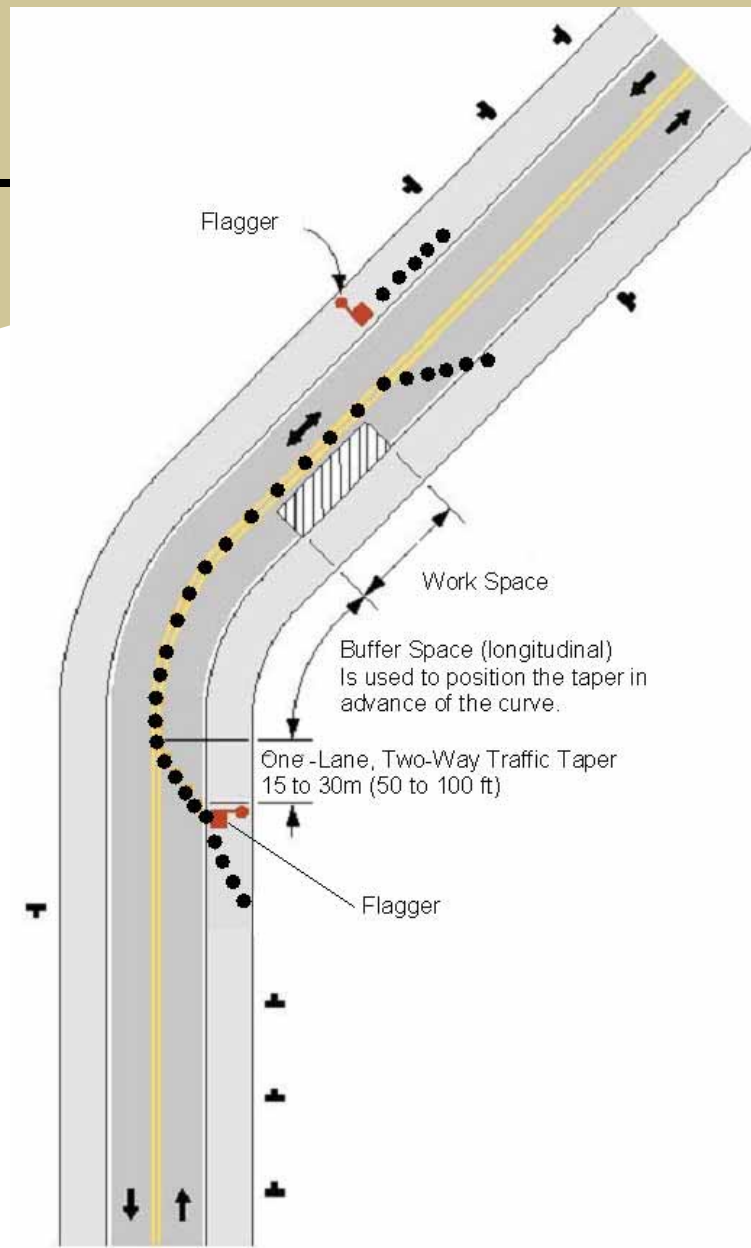
Lane Encroachment

- **35 mph or less**, a minimum of 10 feet of lane width should be maintained.
 - **40 mph or higher**, if encroachment is necessary the lane shall be closed.
-

Tangent

The straight away area between the work area and the lane of traffic that runs from the transition taper to the downstream taper.

Tangent, *cont....*



Termination Area

**Downstream Taper = 100 feet minimum
(per lane)**

Used to return traffic to the normal traffic path.

It may not be necessary to install a downstream taper or an END ROAD WORK sign if it is obvious to motorists that they have passed through the work zone.

Channelizing Device Spacing - WA

Merging/Shifting/Shoulder tapers

<i>MPH</i>	<i>Taper</i>	<i>Tangent</i>
50/70	40	80
35/45	30	60
25/30	20	40

One-Lane, Two-Way/Flagger Taper

Approximately 20 feet

Downstream Termination Taper

Approximately 20 feet

Channelizing Device Spacing - Oregon

The maximum space between channelizing devices in a taper in feet normally approximates the posted speed limit in miles per hour. Closer spacing between devices may be advisable. ODOT has adopted closer channelizing device spacing.

***ODOT Channelizing Device Spacing Merging/Shifting/Shoulder tapers**

<u>MPH</u>	<u>Taper</u>	<u>Tangent</u>
25/40	20'	20'
45/65	40'	40'

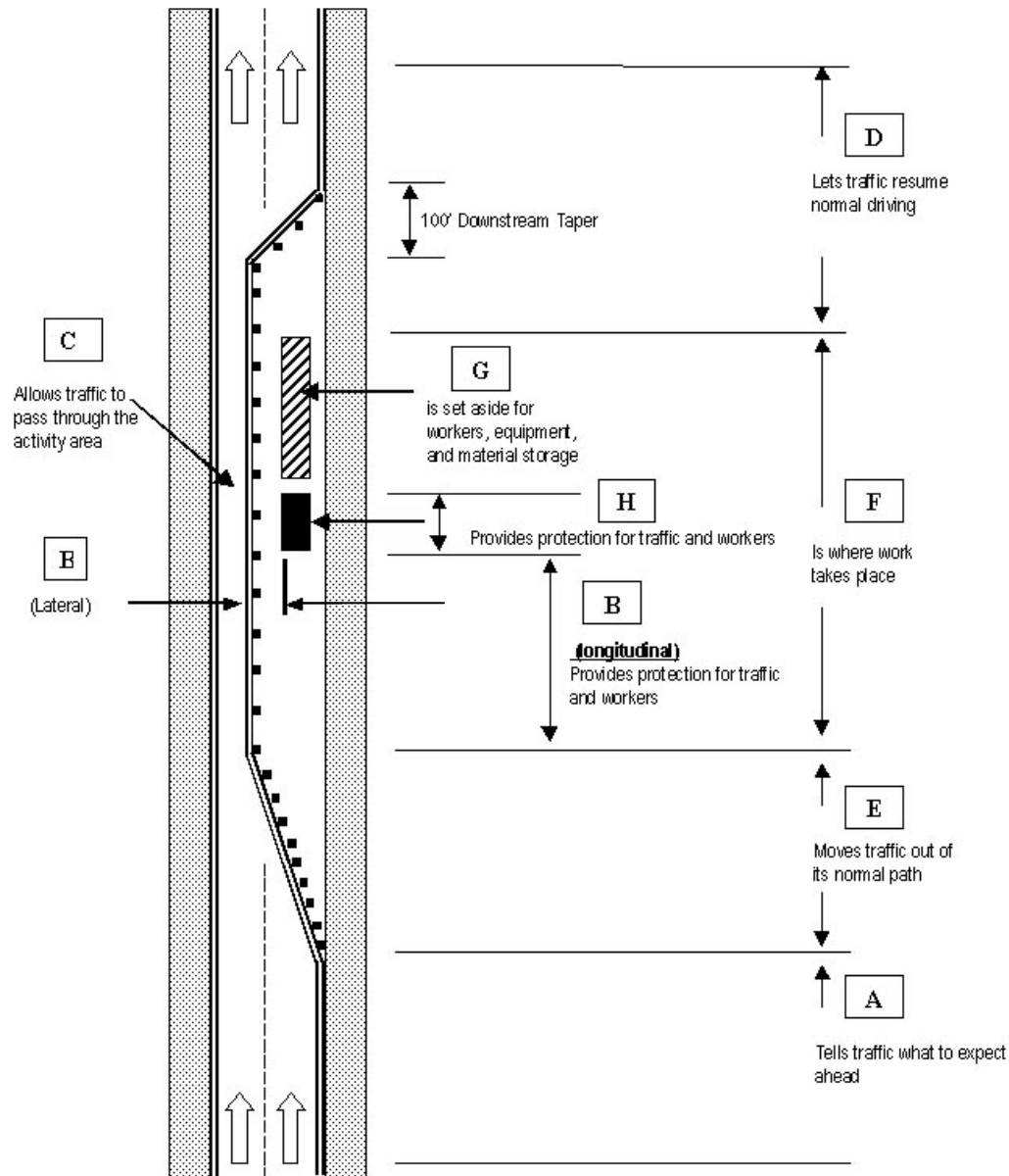
One-Lane, Two-Way/Traffic Taper-Approximately 20 feet
Downstream taper-Approximately 20 feet

Exercise #1

TRAFFIC CONTROL PLAN ELEMENT IDENTIFICATION

Figure 6C-1, MUTCD 2000

Component parts of a temporary traffic control zone



Exercise #1

ANSWERS

CHAPTER 7

TRAFFIC CONTROL PLANS and Typical Applications

Temporary Traffic Control

- The needs and control of all road users, bicyclists and pedestrians within the highway including persons with disabilities in accordance with the ADA through the work zone shall be an essential part of highway construction, utility work, maintenance operations and the management of traffic incidents (*Standard statement – 2003 MUTCD*)
-

Temporary Traffic Control

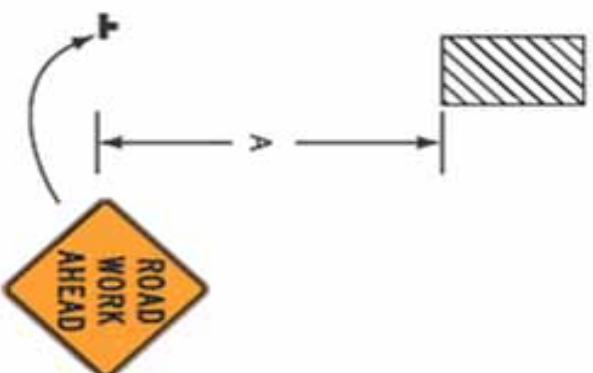
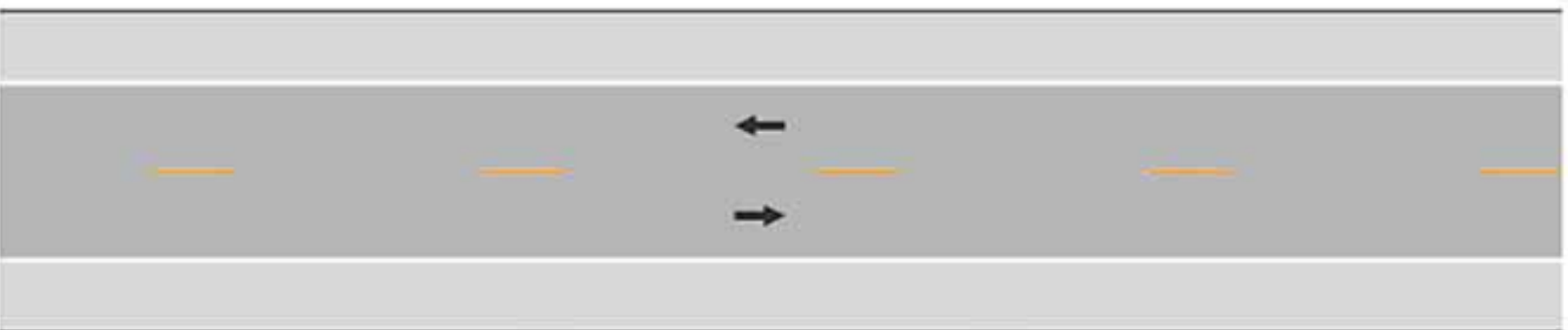
- Traffic control plans play a vital role in providing continuity of reasonably safe and efficient road user flow when a work zone, incident, or other event temporarily disrupts normal road user flow.
 - The degree of detail in the TTC plan depends entirely on the nature and complexity of the situation.
-

Temporary Traffic Control

- Traffic control planning should be completed for all work prior to occupying the TTC zone.
- Planning for all road users should be included in the process.

Work Beyond the Shoulder (TA-1)

- **Vehicle hazard warning signals shall not be used instead of the vehicle's rotating lights or strobe lights. (*Standard*)**
 - **If work is in the median of a divided highway, warning sign should also be placed on the left.**
 - **ROAD WORK AHEAD sign may be replaced with the SHOULDER WORK sign.**
 - **ROAD WORK AHEAD sign may be omitted if:**
 - **work space is behind a barrier**
 - **more than 24" behind the curb, or**
 - **15 ft or more from the edge of any roadway.**
-



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 1

Blasting Zone (TA-2)

- **Whenever blasting caps are used within 300 m (1,000 ft) of a roadway, the signing shown shall be used. (*Standard*)**
 - **The signs shall be covered or removed when there are no explosives in the area or the area is otherwise secure. (*Standard*)**
 - **Whenever a side road intersects the roadway between the **BLASTING ZONE AHEAD** sign and the **END BLASTING ZONE** sign, or a side road is within 300 m (1,000 ft) of any blasting cap, similar signing, as on the mainline, shall be installed on the side road. (*Standard*)**
 - **Prior to blasting, the blaster in charge shall determine whether road users in the blasting zone will be endangered by the blasting operation. If there is danger, road users shall not be permitted to pass through the blasting zone during blasting operations. (*Standard*)**
-

Figure 60-1. *Warning Zone (2a-d)*

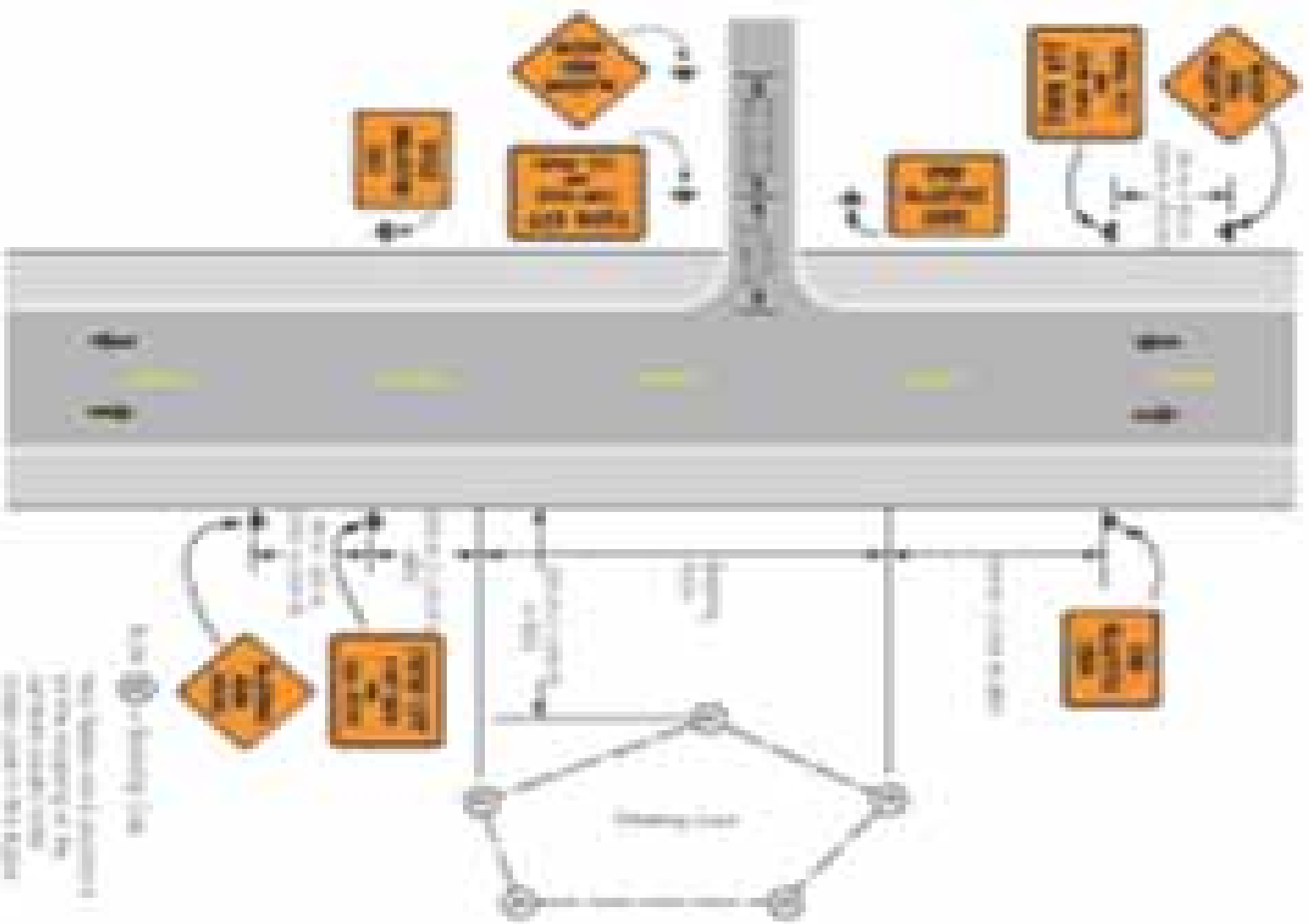
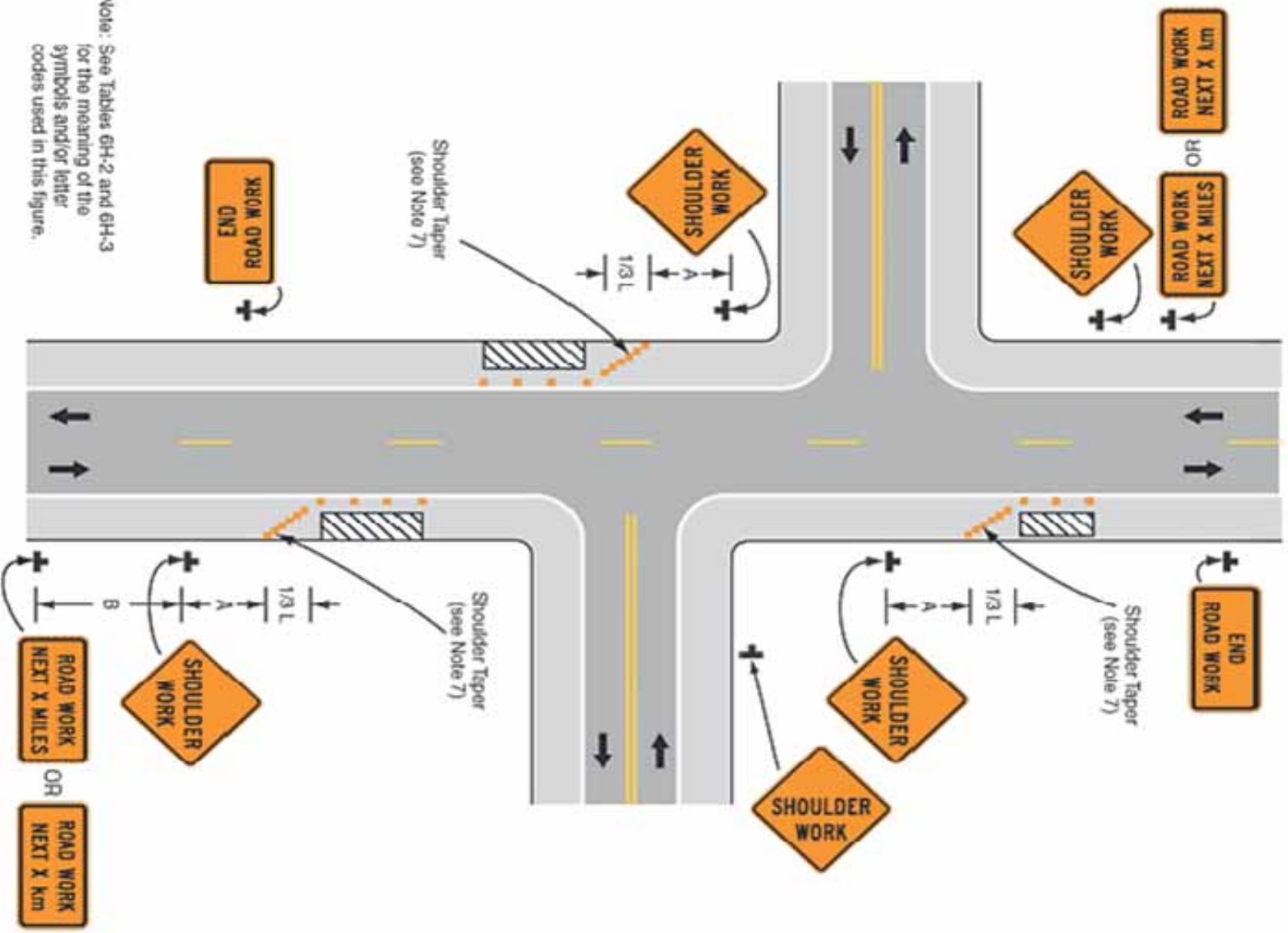


Figure 60-1. *Warning Zone (2a-d)*

Work On Shoulders (TA-3)

- **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. (*Standard*)**
 - **If an arrow panel is used for an operation on the shoulder, the caution mode shall be used. (*Standard*)**
 - **Where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 5 mi.**
 - **In situations where the distance between the advance signs and the work is 2 mi to 5 mi, a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.**
-



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 3

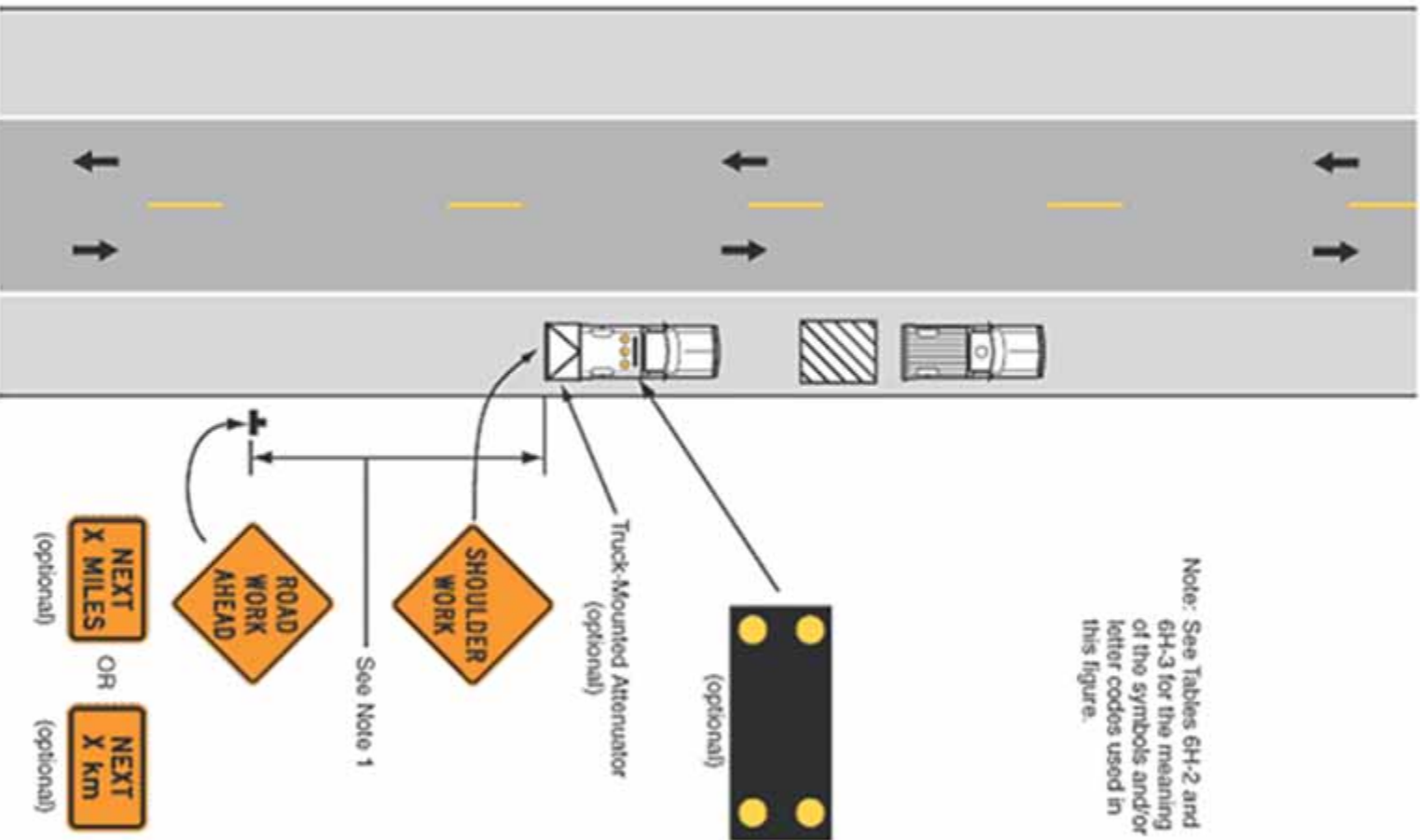
Short Duration/Mobile on Shoulder (TA-4)

- **In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 8 km (5 miles)**
 - **In those situations where the distance between the advance signs and the work is 3.2 km (2 mi) to 8 km (5 mi), a supplemental distance plaque should be used with the ROAD WORK AHEAD sign.**
 - **The ROAD WORK AHEAD XX km (MILES) sign may be used instead of the ROAD WORK AHEAD sign if the work locations occur over a distance of more than 3.2 km (2 miles)**
-

Short Duration/Mobile on Shoulder (TA-4)

- **Warning signs may be omitted when the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights if the distance between work locations is 1.6 km (1 miles) or more and if the work vehicle travels at vehicular traffic speeds between locations.**
 - **Vehicle hazard warning signals may be used to supplement high-intensity rotation, flashing, oscillating or strobe lights.**
 - **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotation, flashing, oscillating or strobe lights. (*Standard*)**
 - **If an arrow panel is used for an operation on the shoulder, the caution mode shall be used. (*Standard*)**
-

Figure 6H-4. Short-Duration or Mobile Operation on Shoulder (TA-4)



Typical Application 4

Shoulder Work w/Minor Encroachment (TA-6)

- **All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.**
 - **The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.**
 - **For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.**
 - **Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 3 m (10 ft) is maintained.**
-

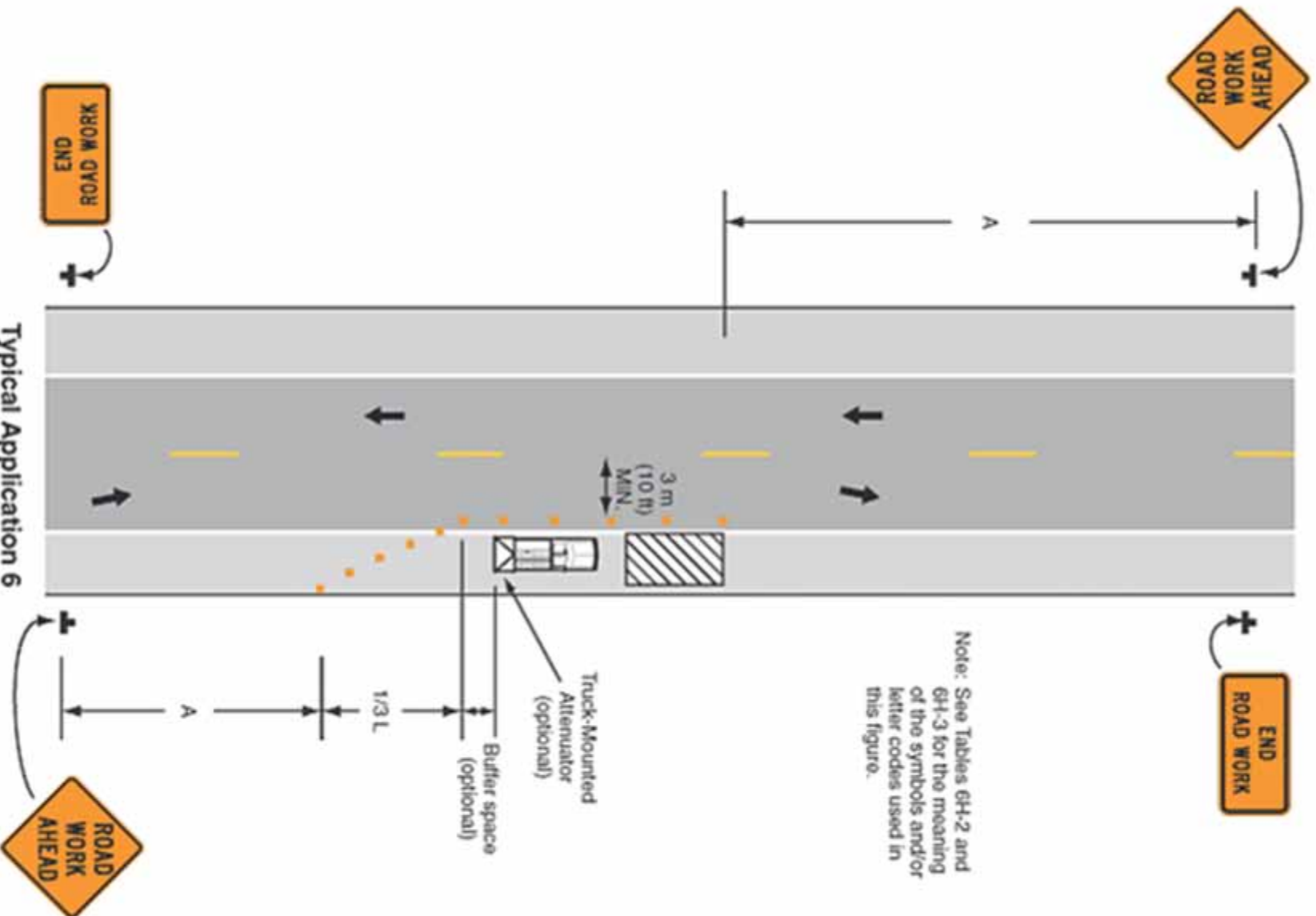
Shoulder Work w/Minor Encroachment (TA-6)

- **Additional advance warning may be appropriate, such as a ROAD NARROWS sign.**
 - **Temporary traffic barriers may be used along the work space.**
 - **The shadow vehicle may be omitted if a taper and channelizing devices are used.**
 - **A truck-mounted attenuator may be used on the shadow vehicle.**
 - **For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.**
-

Shoulder Work w/Minor Encroachment (TA-6)

- **Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.**
 - **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. (*Standard*)**
-

Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)



Road Closure with Diversion (TA-7)

- **Signs and object markers are shown for one direction of travel only.**
 - **Devices similar to those depicted shall be placed for the opposite direction of travel. (*Standard*)**
 - **Pavement markings no longer applicable shall be removed or obliterated as soon as practicable. (*Standard*)**
 - **Temporary barriers and end treatments shall be crashworthy. (*Standard*)**
-

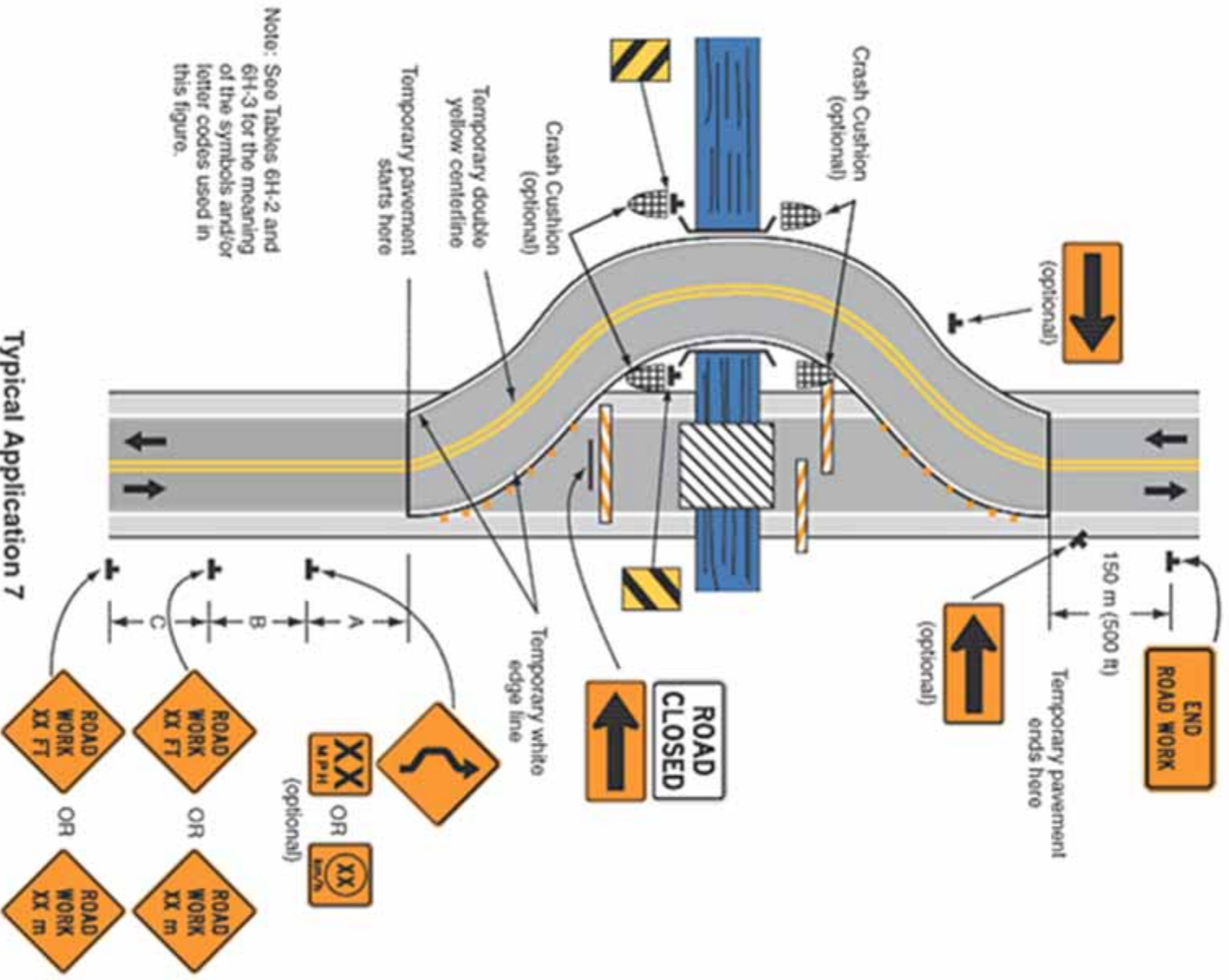
Road Closure with Diversion (TA-7)

- **If the tangent distance along the temporary diversion is more than 180 m (600 ft), a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.**
 - **When the tangent section of the diversion is more than 180 m (600 ft), and the diversion has sharp curves with recommended speeds of 50 km/h (30 mph) or less, Reverse Turn signs should be used.**
 - **Where the temporary pavement and old pavement are different colors, the temporary pavement should start on the tangent of the existing pavement and end on the tangent of the existing pavement.**
-

Road Closure with Diversion (TA-7)

- **Flashing warning lights and/or flags may be used to call attention to the warning signs.**
 - **On sharp curves, large arrow signs may be used in addition to other advance warning signs.**
 - **Delineators or channelizing devices may be used along the diversion.**
-

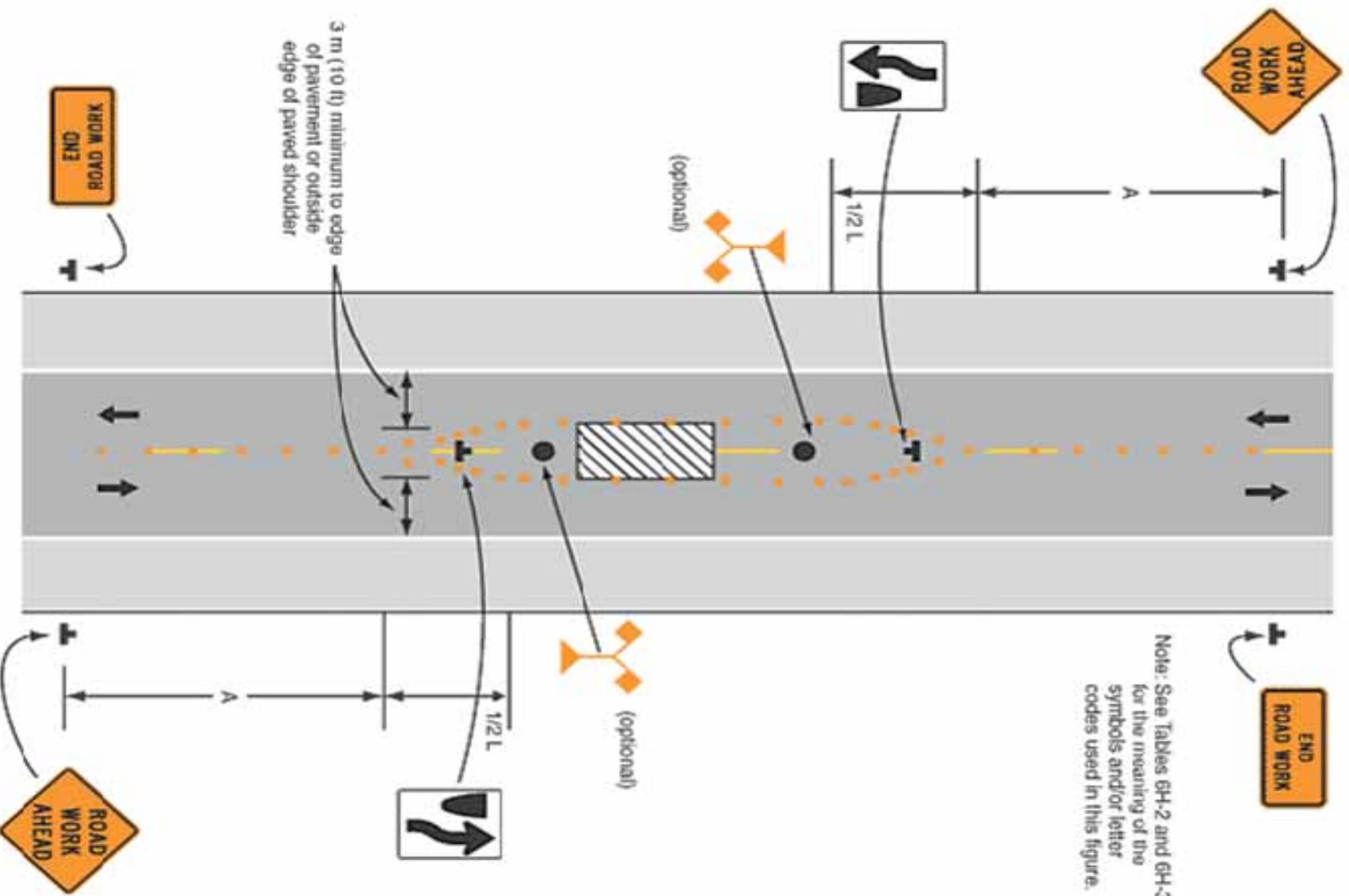
Figure 6H-7. Road Closure with Diversion (TA-7)



Work in Center – Low Volume (TA-15)

- **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. (*Standard*)**
 - **Lanes on either side of the work space should have a minimum width of 10.**
 - **Workers in the roadway shall wear high-visibility safety apparel. (296-155-200 – PPE section)**
-

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.



Typical Application 15

Surveying Along Center Line

- For surveying on the centerline of a high-volume road, one lane shall be closed using the information illustrated in TA-10. (*Standard*)
 - Cones should be placed 6 in to 12 in on either side of the centerline
 - A flagger should be used to warn workers who cannot watch road users.
 - Workers in the roadway shall wear high-visibility safety apparel
 - High-level warning device may be used
 - ROAD WORK AHEAD signs may be used in place of the SURVEY CREW AHEAD signs.
-

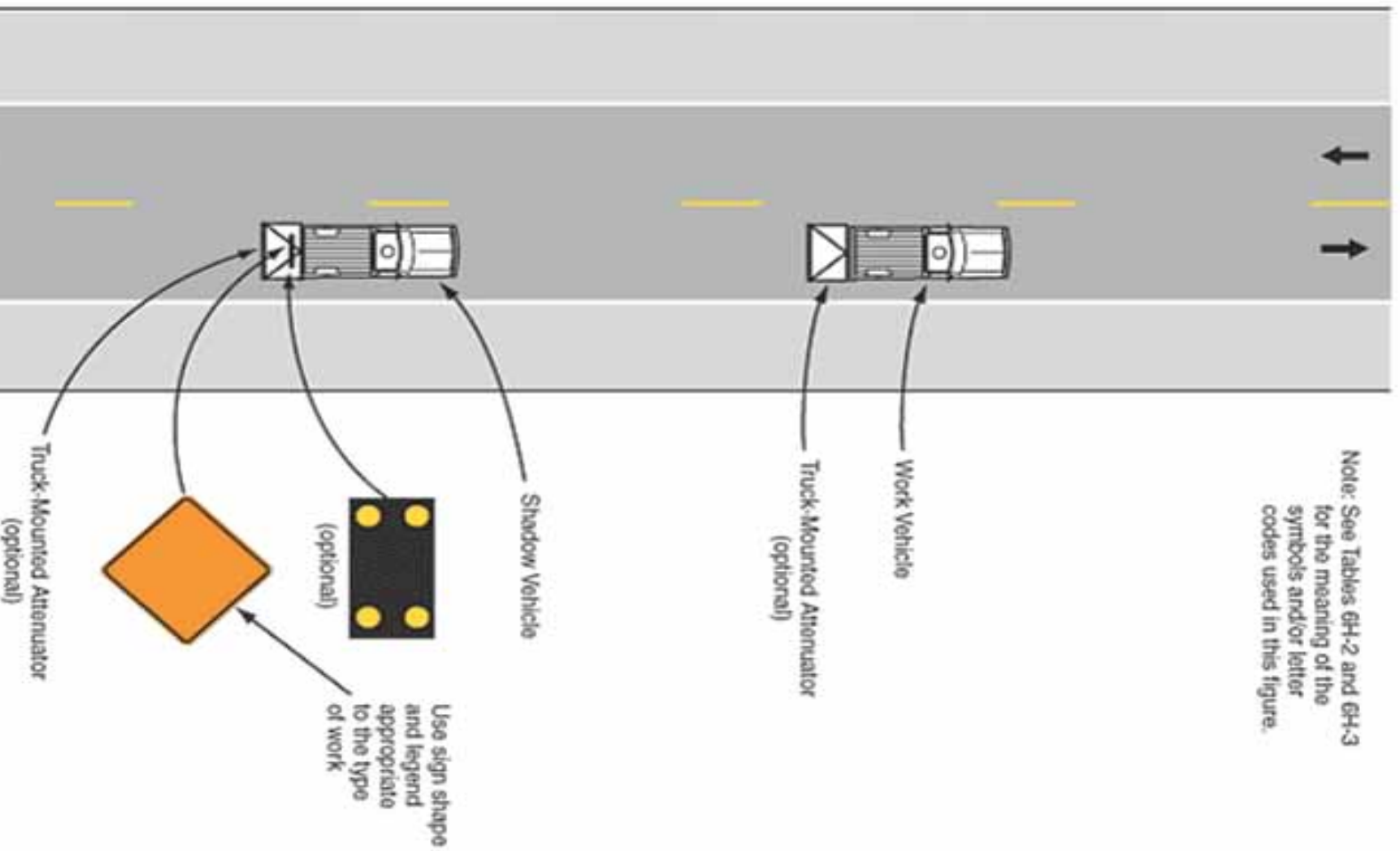
Mobile Operations – Two Lane Road

- **Vehicle-mounted signs shall not be obscured by equipment or supplies. (*Standard*)**
 - **Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights. (*Standard*)**
 - **If an arrow panel is used, it shall be used in the caution mode. (*Standard*)**
 - **Work and shadow vehicles should pull over periodically to allow vehicular traffic to pass.**
 - **When adequate stopping sight distance exists to the rear, the shadow vehicle should proceed at the same speed.**
-

Mobile Operations – Two Lane Road (Cont'd)

- **The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.**
 - **The shadow vehicles should also be equipped with two high-intensity flashing lights mounted on the rear, adjacent to the sign.**
 - **A truck-mounted attenuator may be used on the shadow vehicle or on the work vehicle.**
 - **If the work and shadow vehicles cannot pull over to allow vehicular traffic to pass frequently, a DO NOT PASS sign may be placed on the rear of the vehicle blocking the lane.**
 - **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. (*Standard*)**
-

Note: See Tables 6H-2 and 6H-3
for the meaning of the
symbols and/or letter
codes used in this figure.



Typical Application 17

Lane Closure – Minor Street

- **Used where the work space is short, where road users can see the roadway beyond, and where volume is low.**
 - **This TA shall be used only for low-speed facilities having low traffic volumes. (*Standard*)**
 - **Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used. (*Standard*)**
-



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Work Vehicle (optional)

Truck-Mounted Attenuator (optional)

Buffer Space (optional)

30 m (100 ft) MAX.

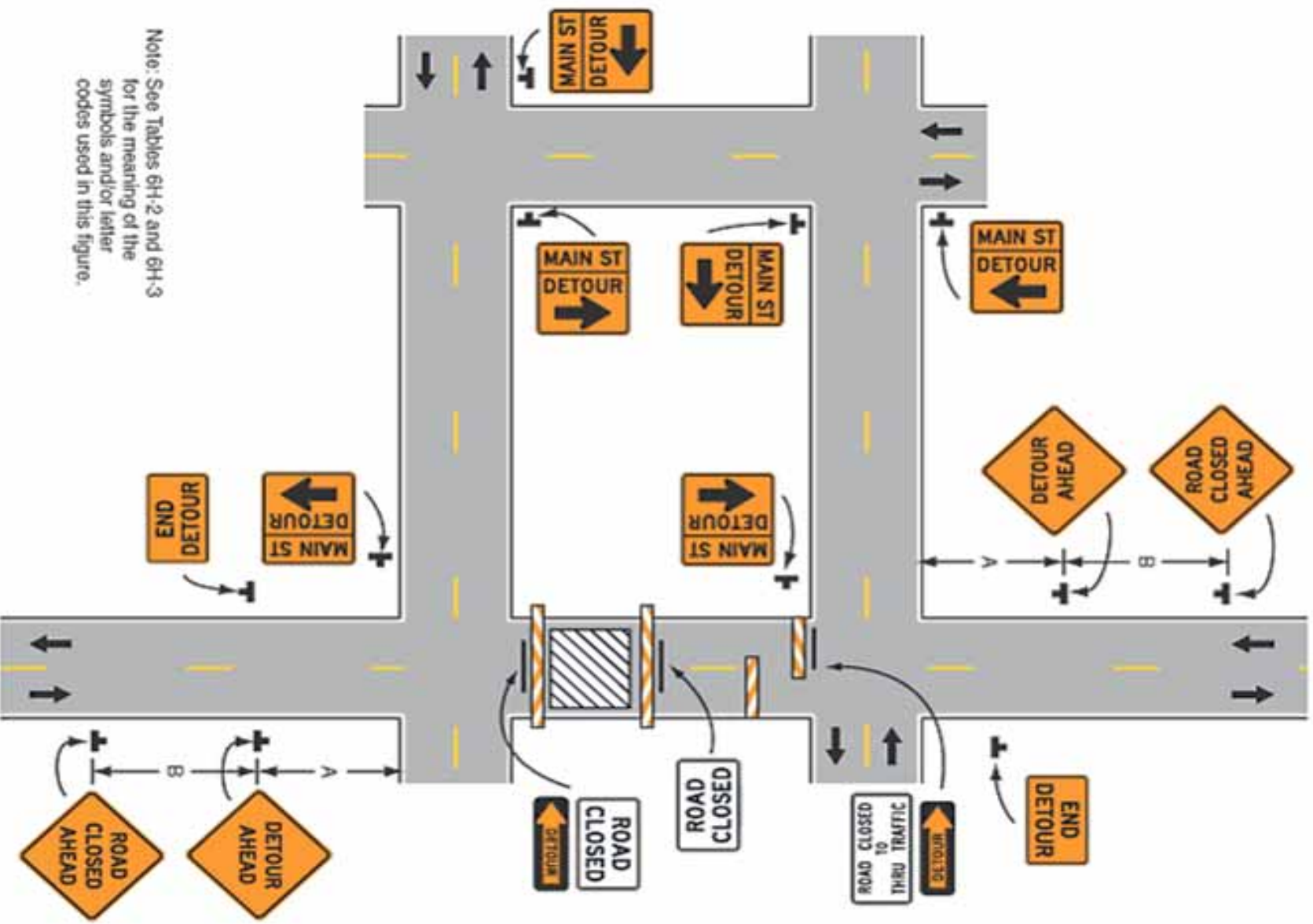
A



Typical Application 18

Detour for Closed Street

- **A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.**
 - **When used, the Street Name sign shall be placed above the Detour sign. (*Standard*)**
 - **On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.**
-

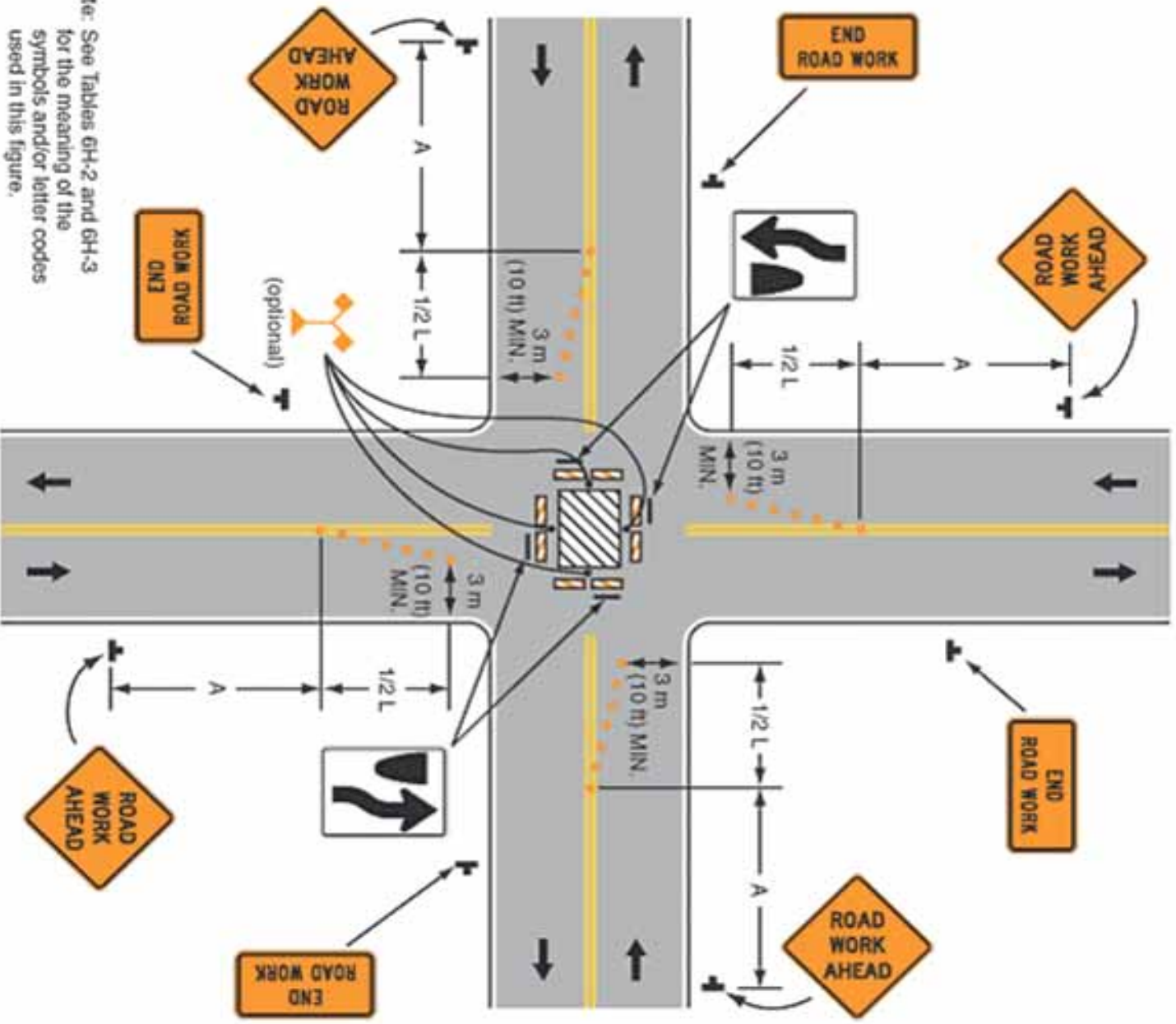


Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 20

Closure – Center of an Intersection

- Lanes should be a minimum of 10 ft in width as measured to the near face of the channelizing devices.
 - For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 ft may be used.
 - Left turns may be prohibited as required by geometric conditions.
 - For short-duration work operations, channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
 - Vehicle warning lights shall not be used instead of high-intensity lights (*Standard*)
-

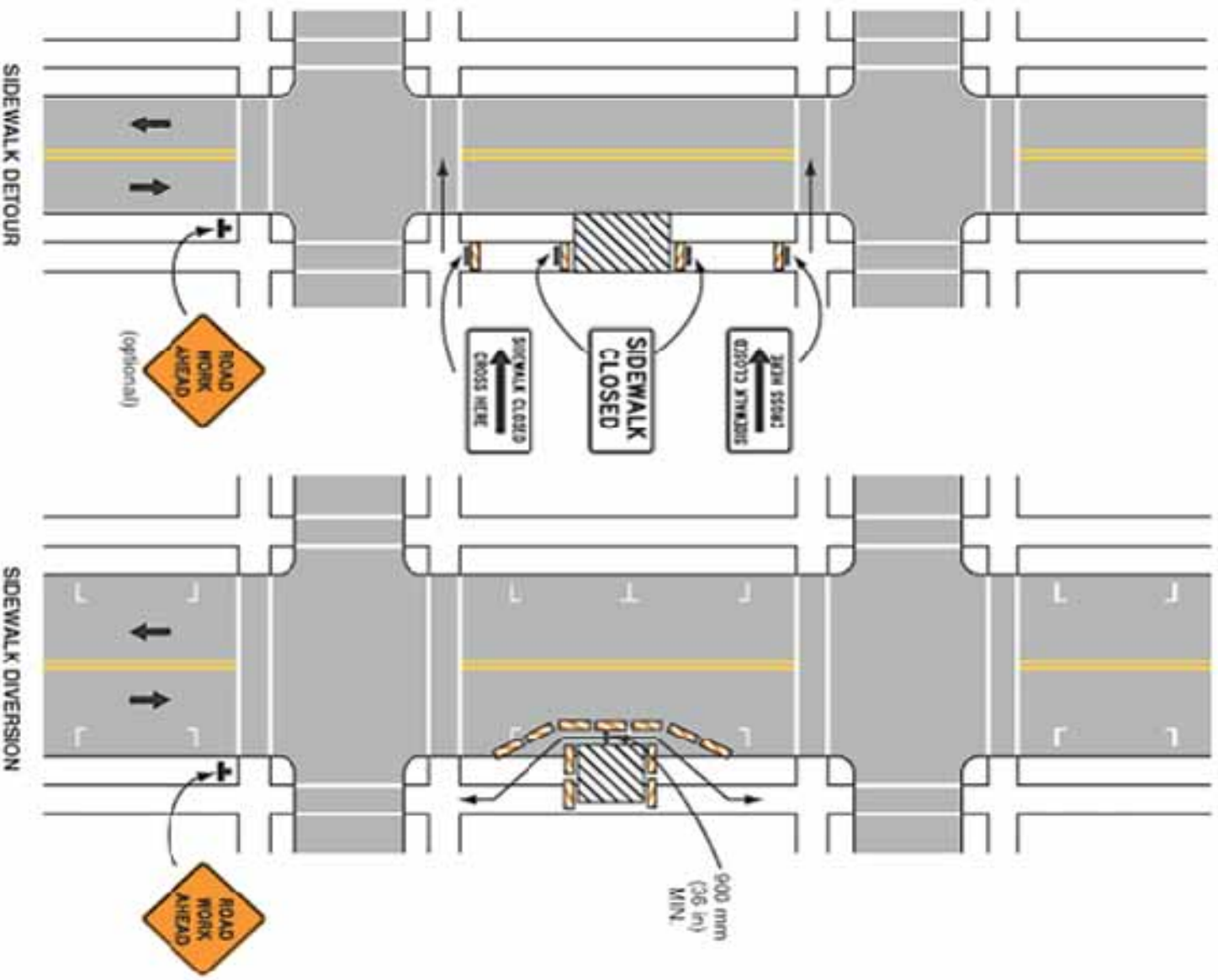


Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 26

Sidewalk Closures

- When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility. (*Standard*)
 - Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.
 - Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.
-



Typical Application 28

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Sidewalk Detour

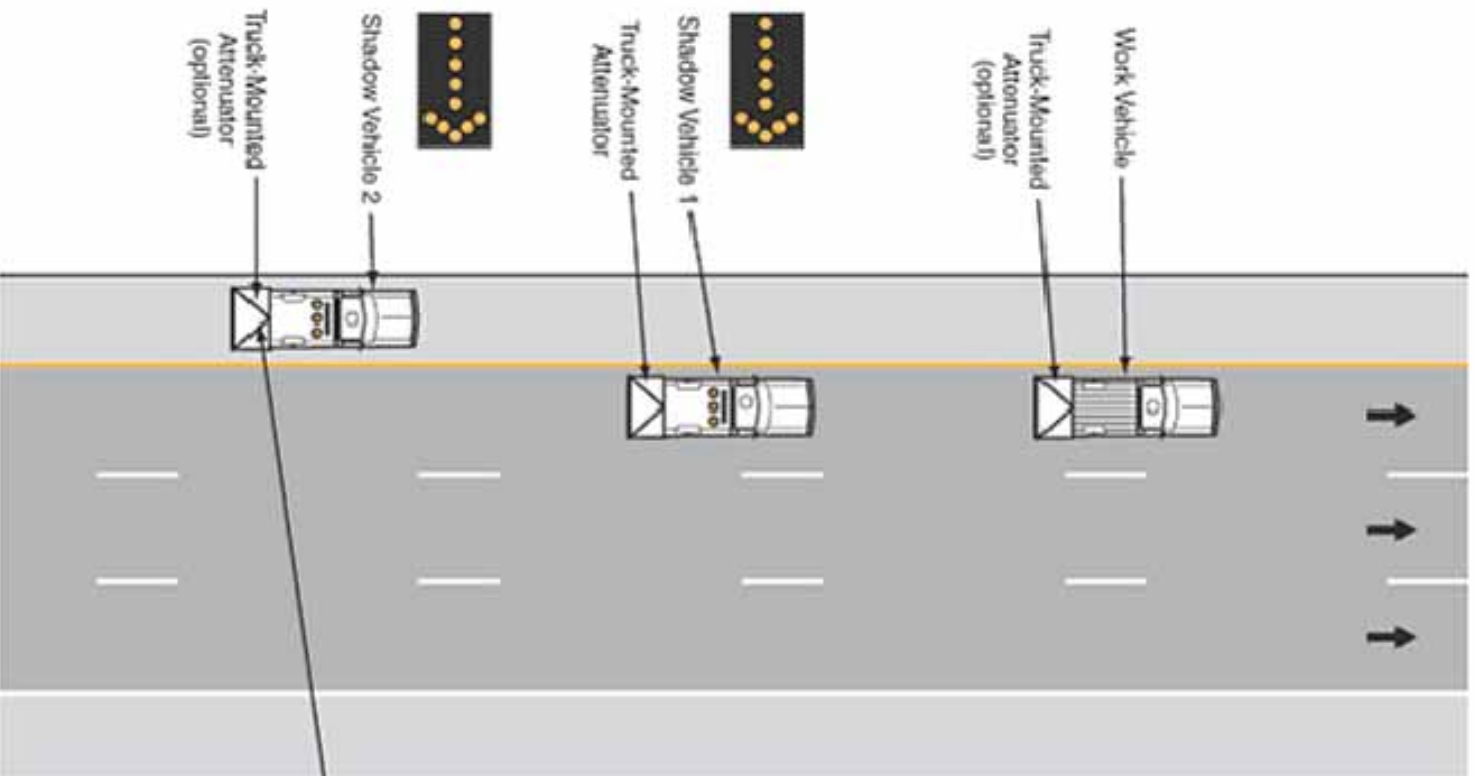
- **When crosswalks are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility. (*Standard*)**
 - **Curb parking shall be prohibited for at least 15 m (50 ft) in advance of the midblock crosswalk. (*Standard*)**
 - **Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.**
 - **Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.**
-

Mobile Operations - Multilane

- **Arrow panels shall, as a minimum, be Type B, with a size of 1500 x 750 mm (60 x 30 in). (*Standard*)**
 - **Vehicles used for these operations should be made highly visible with appropriate equipment, such as: high-intensity rotating, flashing, oscillating, or strobe lights, flags, signs, or arrow panels.**
 - **Shadow Vehicle 1 should be equipped with an arrow panel and truck-mounted attenuator.**
 - **Shadow Vehicle 2 should be equipped with an arrow panel. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow panel.**
-

Mobile Operations – Multilane (Cont'd)

- **Shadow Vehicle 2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.**
 - **The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.**
 - **Work should normally be accomplished during off-peak hours.**
 - **When the work vehicle occupies an interior lane (a lane other than the far right or far left) of a directional roadway having a right shoulder 10 ft or more in width, Shadow Vehicle 2 should drive the right shoulder with a sign indicating that work is taking place in the interior lane.**
-



Typical Application 35

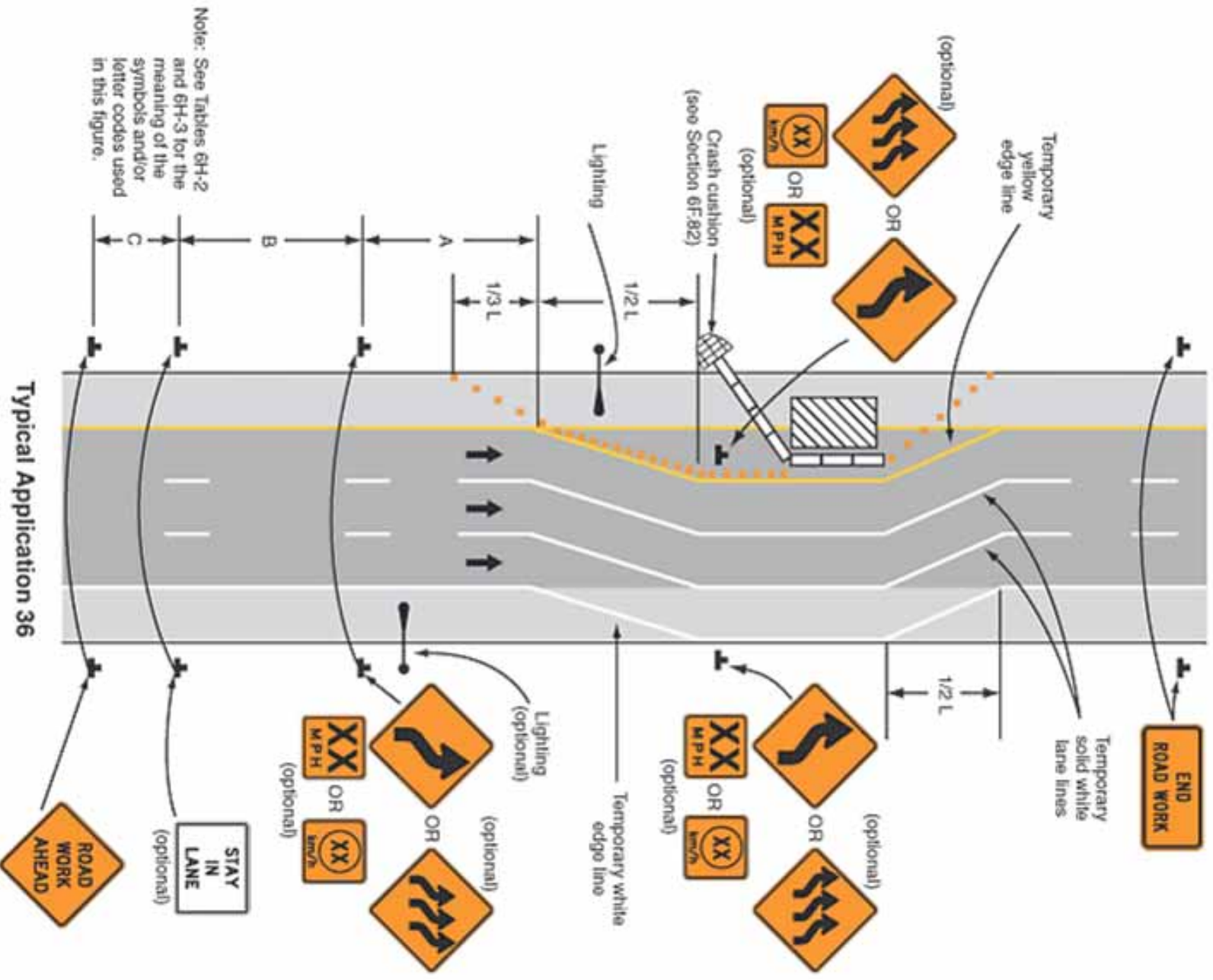
Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Lanes Shifts

- **The lane shift should be used when the work space extends into either the right or left lane of a divided highway and it is not practical to reduce the number of available lanes.**
 - **Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with the provisions of Section 6F.81 MUTCD. (*Standard*)**
 - **A warning sign shall be used to show the changed alignment. (*Standard*)**
 - **If a STAY IN LANE sign is used, then solid white lane lines should be used.**
-

Lanes Shifts (Cont'd)

- **The minimum width of the shoulder lane shall be 10 ft. (*Standard*)**
 - **For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed. (*Standard*)**
 - **The use of a barrier should be based on engineering judgment.**
 - **Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of pavement for nighttime lane closures.**
-

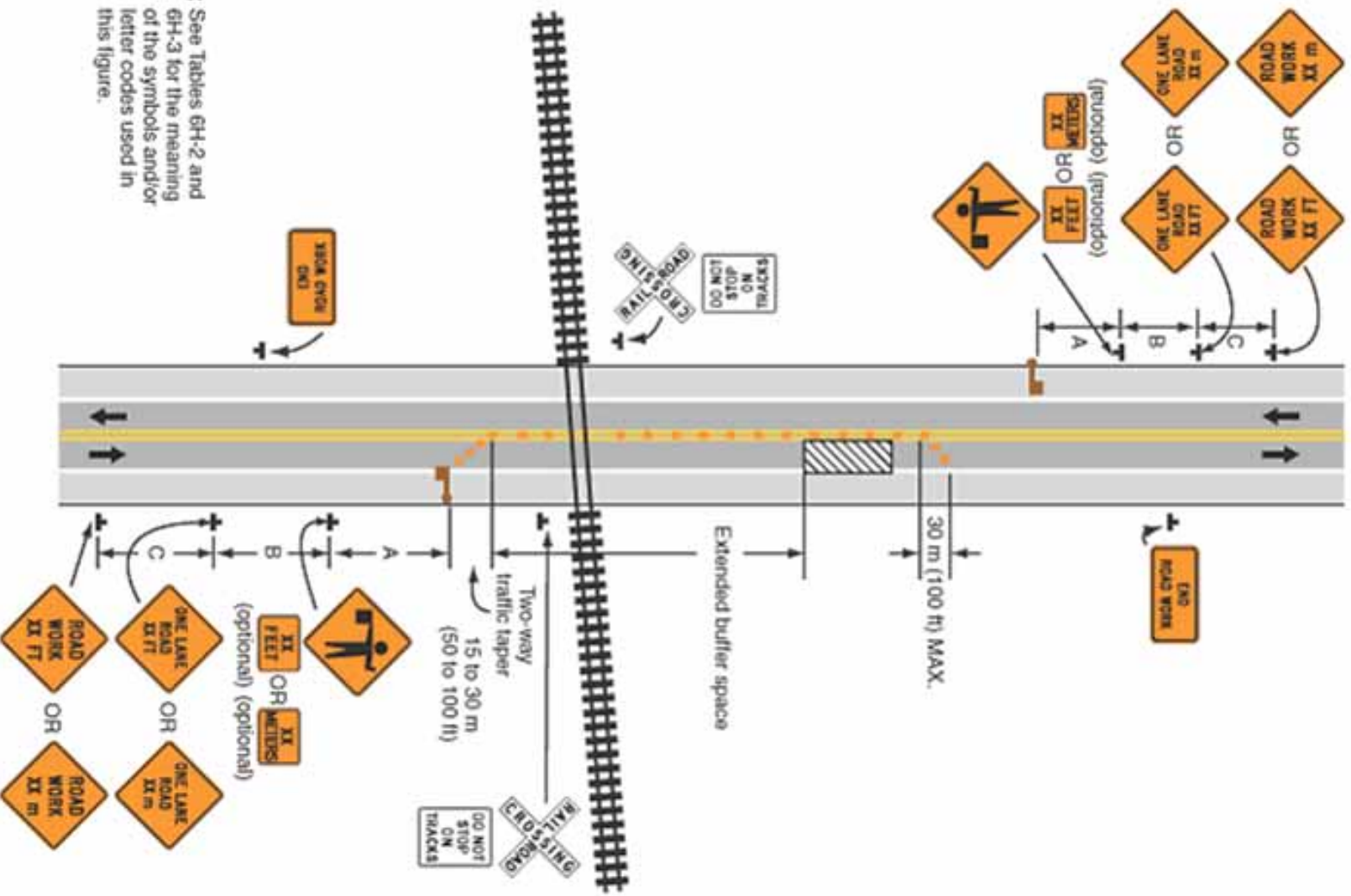


Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 36

Vicinity of Railroad Crossing

- If the queuing of vehicles across active rail tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing even if automatic warning devices are in place. (*Standard*)
 - Early coordination with the railroad company should occur before work starts.
 - The DO NOT STOP ON TRACKS sign should be used on all approaches to a highway-rail grade crossing within the limits of a work zone.
 - At night, flagger stations shall be illuminated, except in emergencies. (*Standard*)
-



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 46

Short Duration Work Zones

- **Activities up to 60 minutes**
 - **Simplified traffic control set-ups are allowed**
 - **Must give careful consideration before choosing any type of traffic control**
 - **Short duration is NOT A SHORT CUT**
 - **Examples of short term:**
 - **Re-lamping**
 - **Pot hole repair**
 - **Surveying**
 - **Minor repairs**
 - **Bridge inspection**
 - **Per-work layout**
-

Short Duration Work Zones

- **No single solution fits all work zones**
 - **Consider full measures**
 - **Consider linking several work areas together**
 - **Consider mobile operations**
 - **Consider “off hour” operations**
 - **Know the site and traffic flows**
-

Short Duration Conditions

- **Lowest impact**

- Low traffic speed and volume
- Short duration (0-20 minutes)

- **Moderate impact**

- Low to high speed / low to moderate volume
- Moderate duration (0 – 40 minutes)

- **High impact**

- High speed and volumes
 - Up to 60 minutes
-

Short Duration Rules

- **When working in live lane or intersection workers must be adequately protected and/or warned.**
 - **Drivers must be adequately warned**
 - **Several intermittent work operations within one-mile area lasting more than 60 minutes consider for mobile or stationary**
 - **High speed/volume may not be for short duration**
 - **Determine worker exposure to traffic hazards**
-

Short Duration Consideration Steps

■ Consider location

- In the lane
- In the intersection
- In the median
- On the shoulder
- Off the roadway

■ Consider hazards

- Traffic
- Equipment
- Fall/Trip
- Debris and other things

■ Worker protection

- Positive protection
- Devices
- Spotters
- Escape route

■ Road user warning

- Dominate devices
 - Signs
 - Channelizing
 - Warning beacons
 - Protective equipment (TMA, etc)
-

Short Duration Do's and Don'ts

■ **Don't**

- **Take short cuts or hurry**
 - **Run across or “dodge” traffic in a live lane**
 - **Work in a live lane under adverse traffic conditions or with proper control even for a few minutes**
 - **Assume that the shoulder area is safe**
 - **Turn your back to oncoming traffic-
AWARENESS to traffic is a must**
 - **Put yourself in an unexpected location that may surprise a driver**
-

Short Duration Do's and Don'ts

■ **Do**

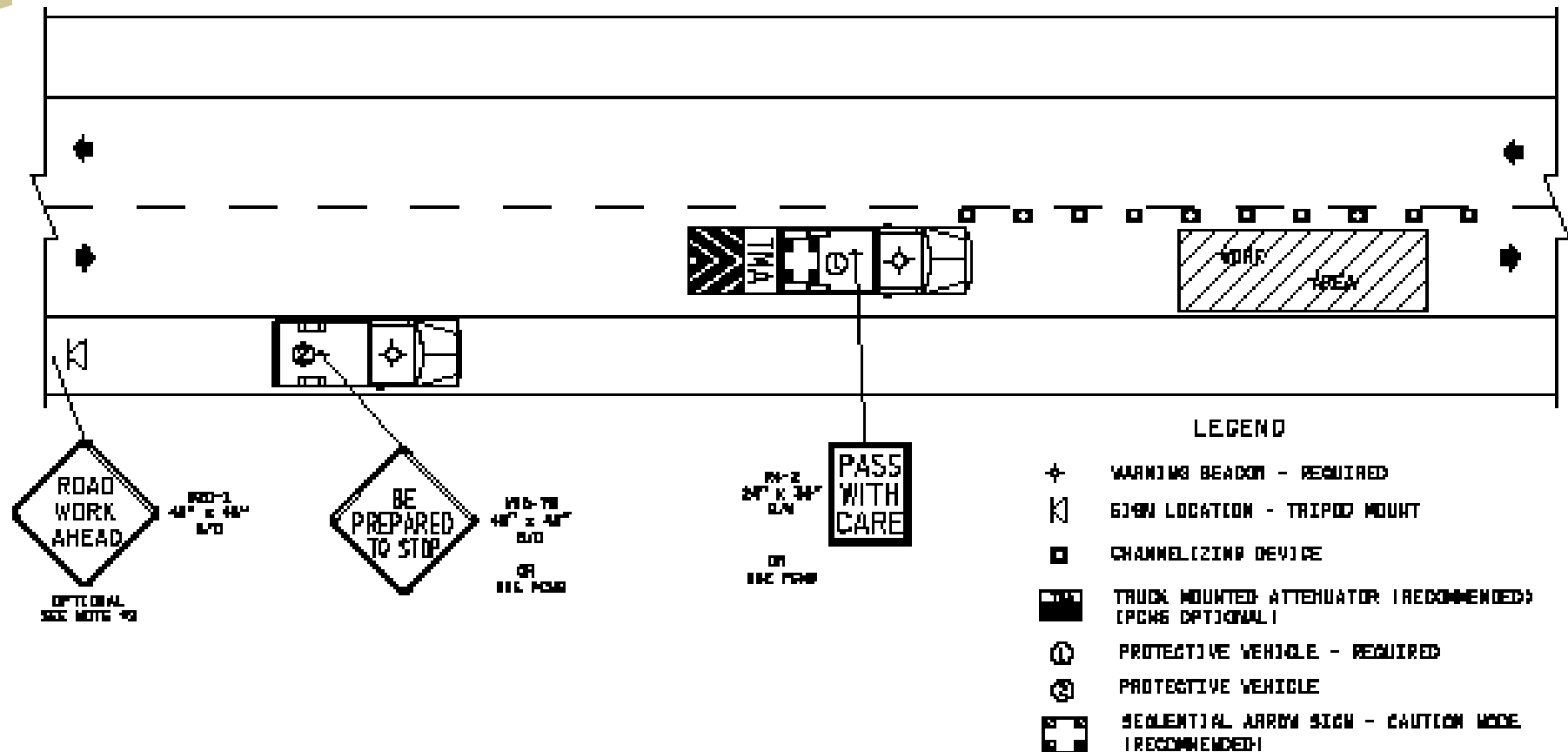
- **Use work vehicle as protection and warning**
 - **Take advantage of any resource that will provide protection (TMA, PCMS, etc)**
 - **Plan ahead**
 - **Find the safest location to park or unload equipment**
 - **Avoid high traffic volume hours and locations**
 - **Work on the same side of the road as the work vehicle and warning devices**
-

WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

- A - ALLOWED, VEHICLE #1 REQUIRED, ALL OTHER DEVICES OPTIONAL.
- B - ALLOWED, VEHICLE #1 REQUIRED, CONSIDER USE OF SPOTTER, DEVICES, VEHICLE #2 AND LOW VOLUME WORK HOURS.
- C - NOT ALLOWED, CONSIDER MOBILE OR STATIONARY TOP'S.

NOTES:

1. STOPPING TRAFFIC FOR UP TO 20 MINUTES MAY ALSO BE ALLOWED.
(CONTACT & COORDINATE WITH REGION TRAFFIC OFFICE)
2. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TOP 27 FOR SIGHT DISTANCE CHART.
3. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.

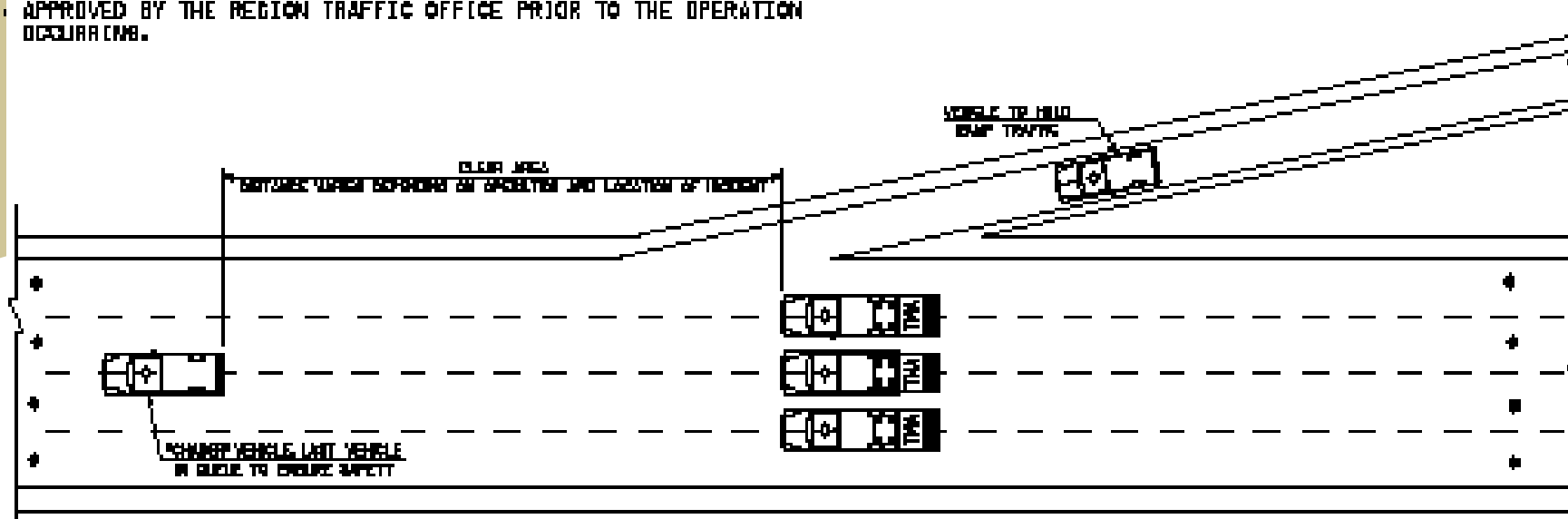


TYPICAL SHORT DURATION LANE CLOSURE

Rolling Slowdown

- Used for emergencies or very specific traffic control
 - Traffic control vehicles form a moving blockade allowing gaps in traffic
 - Other controls should be considered first
 - Sight distance extremely important
 - Chase vehicle follows last vehicle ahead of blockade (Let's you know it's clear)
 - Block all ramps / entrances
 - Radio communications extremely important
-

THIS PLAN DEPICTS THE MINIMUM REQUIREMENTS TO PERFORM AN EMERGENCY ROLLING SLOWDOWN. IF THE SLOWDOWN IS, OR CAN BE, A PLANNED EVENT, THEN A SITE SPECIFIC TRAFFIC CONTROL PLAN SHOULD BE DEVELOPED AND APPROVED BY THE REGION TRAFFIC OFFICE PRIOR TO THE OPERATION OCCURRING.



SAMPLE MESSAGE	
TRUCK MOUNTED PCMS	
1	2
SLOW OR STOPPED VEHICLES	DO NOT PASS
1.6 SEC	1.4 SEC

LEGEND



TRUCK MOUNTED ATTENUATOR (RECOMMENDED)



WARNING BEACON



SEQUENTIAL ARROW - CAUTION MODE (REQUIRED)

OPERATIONAL NOTES

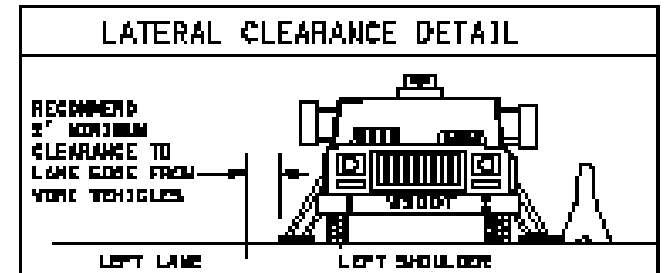
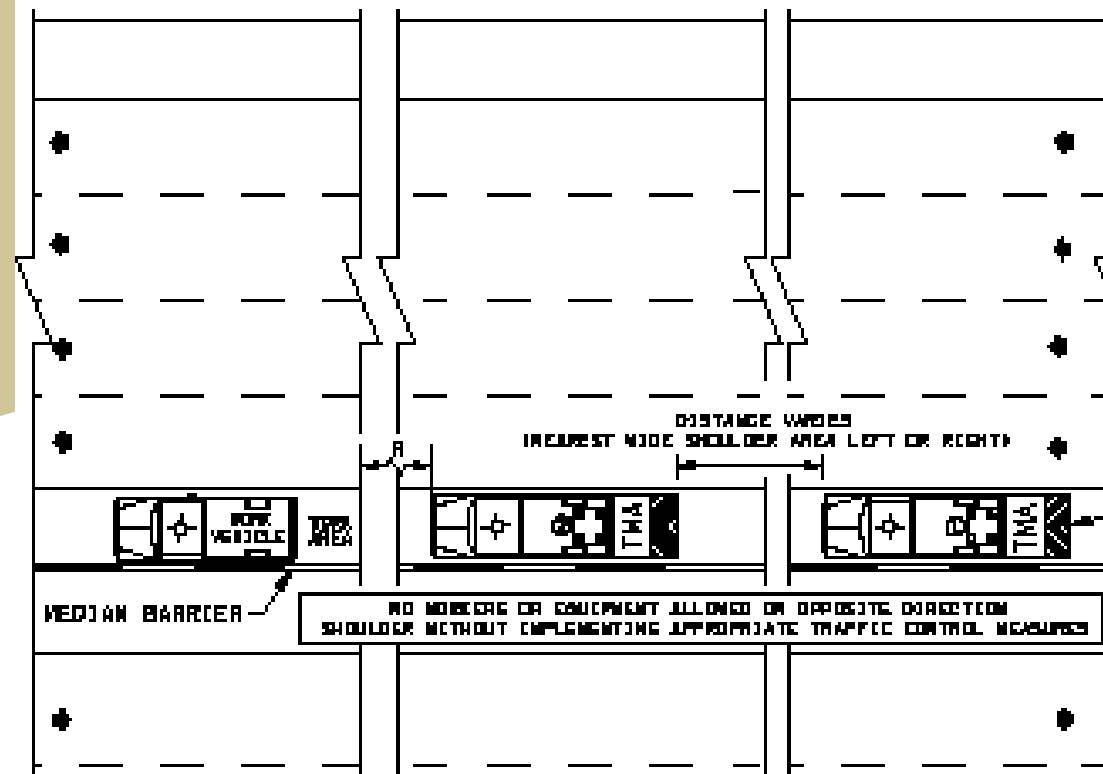
1. ALL WORK VEHICLES SHALL USE FLASHING BEACONS.
2. THE NUMBER OF VEHICLES SHOWN IS A MINIMUM. IF POSSIBLE USE ONE VEHICLE PER LANE DURING SLOWDOWN.
3. TSP SHALL BE NOTIFIED AND ON SITE WHEN AVAILABLE.
4. ALL ON-RAMP TRAFFIC SHALL BE STOPPED DURING SLOWDOWN.

TYPICAL ROLLING SLOWDOWN

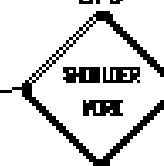
Mobile Work Zones

- **Activities move intermittently or continuously**
 - **May need shadow vehicle, channelizing devices, truck mounted signs, PCMS, TMAs, warning lights and flaggers**
 - **Communications is paramount**
 - **Site distances is important**
-

TYPICAL FREEWAY APPLICATION (ACTUAL NUMBER OF LANES MAY VARY)



W21-B
48" x 48"
B/D



SAMPLE MESSAGE

PCMS	
1	2
LEFT SHOULDER CLOSED	SLOW MOVING VEHICLES
1.8 SEC	1.8 SEC

FIELD TESTS IN DELAWARE
AT 100 MPH
(TRUCK MOUNTED OR TRAILER MOUNTED OPTIONAL)

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCES VARY AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED

OPERATIONAL NOTES

1. PROTECTIVE VEHICLE #1, MOUNT SHOULDER CLOSURE SIGN ON BACK OF VEHICLE. DO NOT OPERATE SEQUENTIAL ARROW PANEL. MAINTAIN 1000' TO 1800' OF ROLL AHEAD DISTANCE TO APPROACHING TRAFFIC (TMA RECOMMENDED).
2. PROTECTIVE VEHICLE #2, POSITION VEHICLE TO PROVIDE PROTECTION OF SITE. MAINTAIN ROLL-AHEAD DISTANCE (TMA RECOMMENDED).
3. 2' MINIMUM CLEARANCE RECOMMENDED BETWEEN LANE EDGE AND WORK VEHICLE. ADJACENT LANE MUST BE CLOSED IF ADDITIONAL CLEARANCE IS REQUIRED ON IF WORK ACTIVITIES ACTIVELY IMPEDING TRAFFIC.
4. CONTACT REVERA TRAFFIC MANAGEMENT CENTER PRIOR TO WORK BEGIN AND END.
5. PEMS RECOMMENDED.

LEGEND

SEQUENTIAL ARROW PANEL - TYPE "B"
(CAUTION MODE)

TRUCK MOUNTED ATTENUATOR

WARNING BEACON - REQUIRED

MOBILE FREEWAY OPERATION
LEFT SHOULDER CLOSED
TCP 22

PCMS	
1	2
LEFT LANE CLOSED	WHEE RIGHT
1.9 SEC	1.9 SEC

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCE VARY AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED

Diagram illustrating a two-lane road configuration with a median barrier and shoulder. The diagram shows a cross-section of the road with a median barrier on the left, a travel lane in the middle, and a shoulder on the right. A vehicle is shown on the shoulder. A sign on the right indicates "LEFT LANE CLOSED AHEAD". A note at the bottom states: "NO WORKERS OR EQUIPMENT ALLOWED ON OPPOSITE DEIRECTION SHOULDER WITHOUT IMPLEMENTING APPROPRIATE TRAFFIC CONTROL MEASURES."

3. SHOWN VEHICLE #1, MOUNT LANE CLOSURE SIGN ON BACK OF VEHICLE, OR NOT
OBTAINING ADDITIONAL WORK PANEL, MOUNTING SIGN TO END OF SHORT
DISTANCE TO APPROACHING TRAFFIC IT IS RECOMMENDED.
4. PROTECTING VEHICLE #2, POSITION VEHICLE TO PROVIDE PROTECTION OF WORK.
ADDITIONAL SIGN SHOWN DISTANCE IT IS RECOMMENDED.
5. IF WORKING CLEARANCE RECOMMENDED BETWEEN LANE CLOSURE AND WORK VEHICLE.
ADDITIONAL LANE MUST BE CLOSED IF ADDITIONAL CLEARANCE IS REQUIRED OR IF
WORK ACTIVITIES JOYFULLY INFLUENCE TRAFFIC.
6. CONTACT SIGN TRAFFIC MANAGEMENT CENTER PRIOR TO WORK BEGINNING AND AFTER ENDING.
7. NOW RECOMMENDED.

DIS: SEQUENTIAL ARROW PANEL - TYPE "B" MCM.

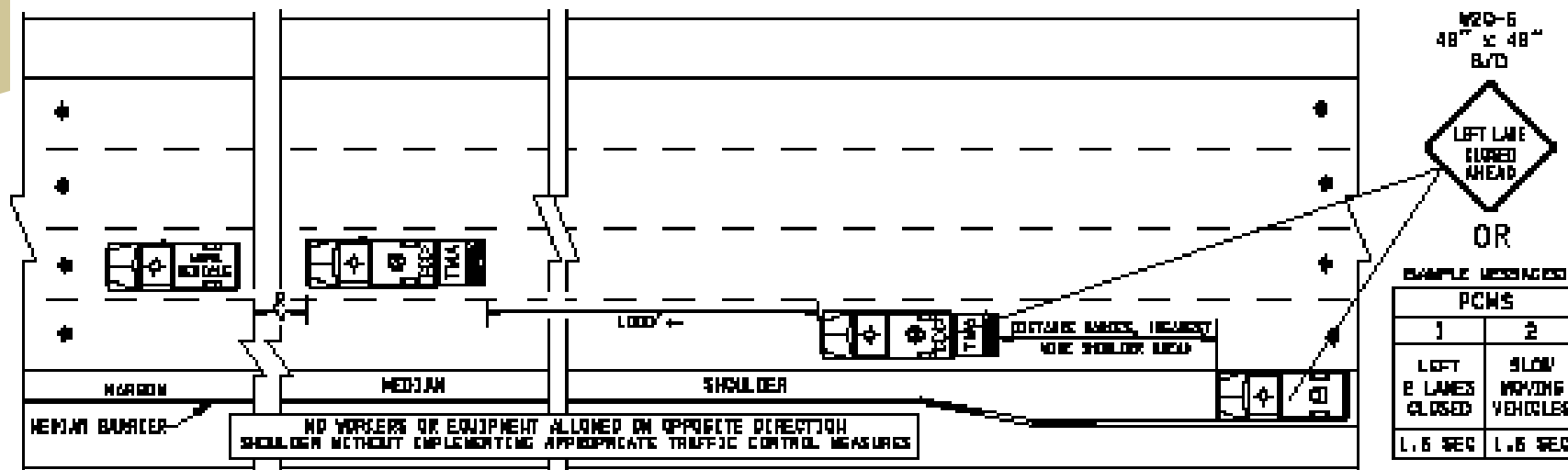
TMA TRACK MOUNTED ATTENUATOR

✱ WARNING BEACON - REQUIRED

MOBILE FREEWAY OPERATION
LEFT LANE CLOSURE
TCP 23

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCES MUST AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED

TYPICAL FREEWAY APPLICATION (ACTUAL NUMBER OF LANES MAY VARY)



OPERATIONAL NOTES

- ADVANCE WARNING VEHICLE #1, MOUNT LANE CLOSURE SIGN ON BACK OF VEHICLE, MAINTAIN 300' TO 1300' SIGHT DISTANCE TO APPROACHING VEHICLES. (TMA RECOMMENDED)
- SHADOW VEHICLE #2, MOUNT LANE CLOSURE SIGN ON BACK OF VEHICLE, DO NOT OBSCURE SEQUENTIAL ARROW PANEL, MAINTAIN 100' TO 300' OF SIGHT DISTANCE TO APPROACHING TRAFFIC (TMA RECOMMENDED).
- PROTECTIVE VEHICLE #3, PROTECT VEHICLE TO PROVIDE PROTECTION OF CREW, MAINTAIN ROLL AHEAD DISTANCE (TMA RECOMMENDED).
- IF MINIMUM CLEARANCE REQUIREMENTS BETWEEN LANE EDGE AND WORK VEHICLE, ADJACENT LANE MUST BE CLOSED IF ADDITIONAL CLEARANCE IS REQUIRED OR IF MORE ATTENTION CONSUMES TRAFFIC.
- CONTACT REGIONAL TRAFFIC MANAGEMENT CENTER PRIOR TO WORK BEGIN AND END.
- PMS RECOMMENDED.

LEGEND

◀◀◀ SEQUENTIAL ARROW PANEL - TYPE "B" MWM.

TMA TRUCK MOUNTED ATTENUATOR (RECOMMENDED)

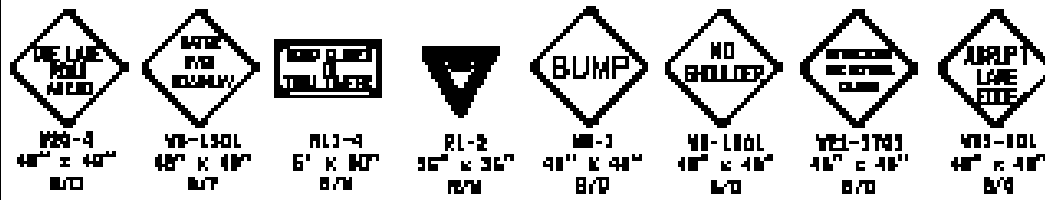
★ WARNING BEACON - REQUIRED

MOBILE FREEWAY OPERATION
MIDDLE LANE WORK AREA
TCP 24

Emergency Operations

- Immediate response a must
 - Make use of available equipment
 - Obtain assistance from Law Enforcement
 - Do not use flares if flammable material is present (i.e., gasoline)
 - Implement appropriate traffic control if situation will last more than 60 minutes
 - This is inherently dangerous – **DO NOT** expose yourself to a life-threatening situation
-

INSTALL THESE OR OTHER WARNING SIGNS AS NEEDED FOR THE SPECIFIC HAZARD.



PDMS	
1	2
CAUTION STORM DEBRIS	ON ROAD NEXT ICE HOLE
1.5 SEC	1.5 SEC

FIELD LOCATE IN ADVANCE OF DEBRIS

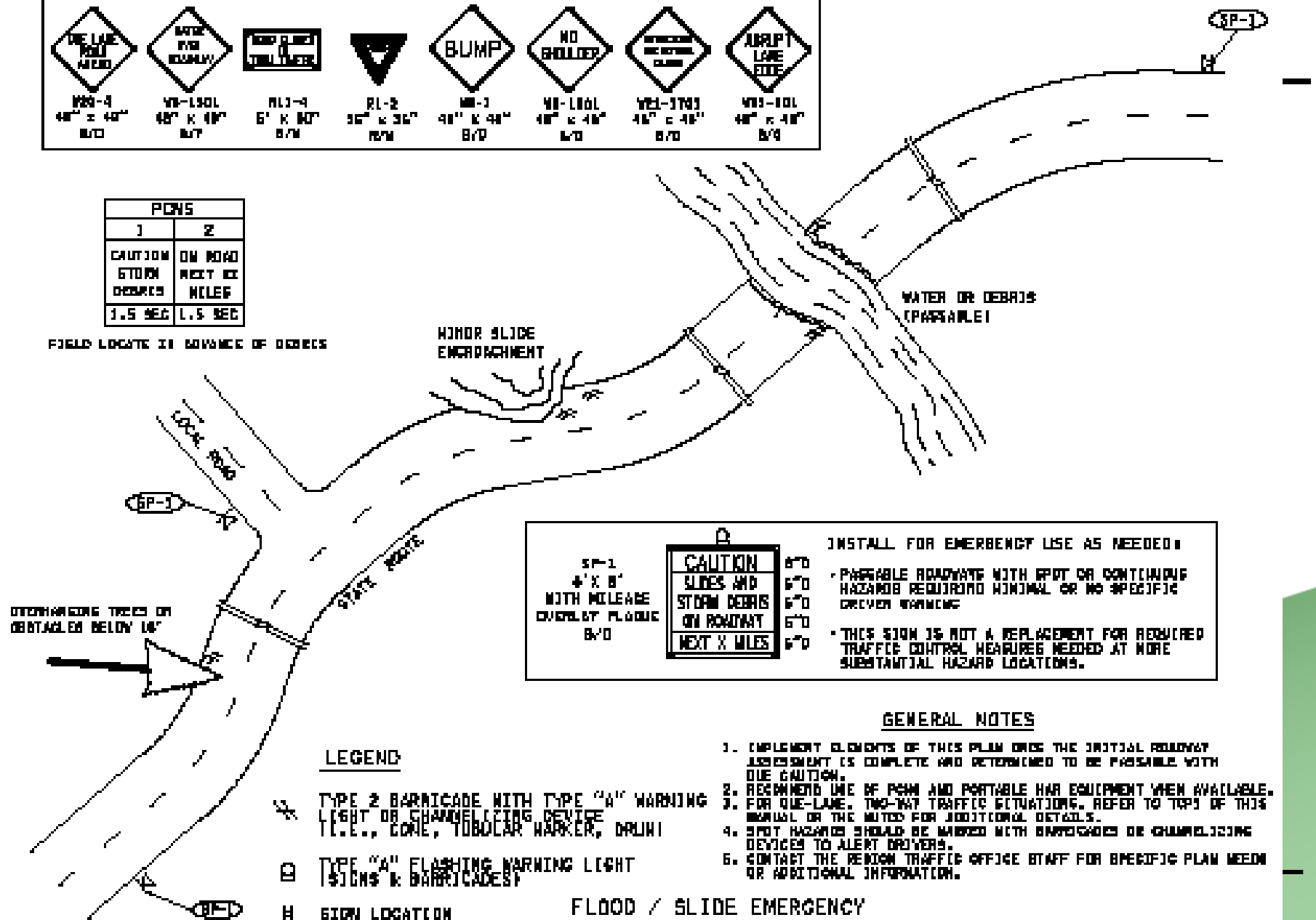
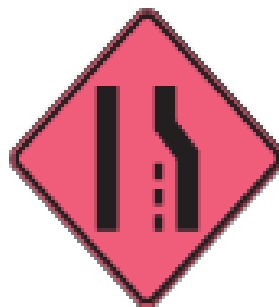


Figure 6I-1. Examples of Traffic Incident Management Area Signs



W3-4



W4-2



W9-3



E5-2a



M4-8a



M4-9



M4-10

CHAPTER 8

FLAGGING

The Flagging Function

- **The primary function of temporary traffic control is to move vehicles and pedestrians safely through or around work zones while protecting on-site workers and equipment. Flagging should only be used when all other methods of traffic control are inadequate to properly carry out this function. Flaggers are used to stop traffic intermittently at worksites and to assign right-of-way, or to slow traffic past the activity area to help protect the work crew.**
 - **The Flagger must be clearly visible, should always face traffic, and should be prepared to warn workers to get out of the way if necessary. Flaggers should be positioned to enable the motorist to properly respond to the flagging instructions before entering the activity area.**
-

The Flagging Function (cont.)

Major problems with flagger operations include the following:

- **Flaggers are very vulnerable to approaching traffic because advance-warning signs provide only limited protection. Flagging is one of the most hazardous activities on the roadway.**
- **Flaggers are sometimes inadequately trained and motivated.**
- **Flagging procedures are sometimes employed where safer methods of traffic control could be used.**

The Flagging Function (cont.)

Flaggers have very important functions in temporary traffic control, which are:

- **Directing traffic through the temporary traffic control zone.**
- **Protecting the lives and property of motorist and pedestrians.**
- **Protecting workers.**
- **Ensuring a safe separation between equipment operations and traffic movement.**
- **Courteously and intelligently respond to motorists' questions.**

Supervisors, flaggers and workers should be advised that ever reasonable effort must be made to prevent excessive delays to the motoring public.

The Flagging Function (cont.)

**Washington State
WAC 296-155-305**

“Flaggers are to be used only when other reasonable traffic control methods will not adequately control traffic in the work zone.”

The Flagging Function (cont.)

- **“It is not recommended to use flaggers at locations, such as freeways....”**
 - **“Use of flaggers to exclusively display the “SLOW” message is not recommended.”**
 - **Uniformed law enforcement officers may be used....**
 - **Every reasonable effort must be made to prevent excessive delays to the motoring public.**
-

Qualifications of Flaggers

MUTCD SECTION 6E-01 AND ODOT SPECIFICATIONS

Individuals assigned to flagging operations should be carefully selected because they are responsible for public safety and have the greatest number of public contracts of all highway workers.

Qualification of Flaggers (cont.)

- **Sense of responsibility for the safety of the public and the workers',**
 - **Adequate training in safe temporary traffic control practices and a current, valid, approved certificate verifying the training in their possession,**
 - **Average intelligence,**
 - **Mental and physical ability to provide timely, clear, and positive guidance,**
 - **Good physical condition, including sight, mobility, and hearing,**
 - **Mental alertness and the ability to react in an emergency**
 - **Courteous but firm manner,**
-

Qualifications of Flaggers (cont.)

- **Neat appearance,**
 - **Be authoritative rather than lax and apologetic,**
 - **Be decisive,**
 - **Be able to communicate with motorists,**
 - **Be able to stay on the job until properly relieved,**
 - **Be reliable,**
 - **Have good judgement,**
 - **Have a good temperament,**
-

Flagger Stations

- **The flagger station must be carefully selected to ensure that the flagger is clearly visible to approaching traffic.**
 - **The distance from the flagger station to the work space must be long enough to enable an errant motorist, who has failed to obey the instructions of the flagger or failed to bring his/her car to a complete stop. Table 6E-1, can be used to locate the flagger station in advance of the work space.**
 - **Flagger stations should also far enough in the approach zone to permit all vehicles to come to a stop. Table 6E-1 may be used in selecting the location of flaggers in the approach area.**
 - **Whenever flagging is necessary for nighttime operations, the flagger stations shall be illuminated.**
-

Flagger Stations (cont.)

To perform their duties properly, flaggers should position themselves according to the following principles:

- **Stand on the shoulder**
 - **Never stand in the lane used by moving traffic.**
 - **Move into a lane being used by traffic only after traffic has stopped. Do not stand in front of stopped vehicles. Stand near the center line.**
-

Flagger Stations (cont.)

- **Be alert to traffic approaching from the opposite direction when standing at or near the centerline of the highway.**
 - **Be clearly visible to approaching traffic at all times.**
 - **Stand alone and in a well-lighted place.**
 - **Don not permit other workers to congregate around the flagger station.**
 - **Maintain color contrast with the background (i.e., equipment, vehicles, trees, etc.)**
 - **Avoid being silhouetted against the bright or the sun.**
 - **At “spot” obstructions, or short lane closures, where adequate sight distance is available, one flagger may be adequate to control traffic and the flagger station may be moved to the shoulder opposite the closed lane.**
-

Flagger Stations (cont.)

Guideline for:

Length of buffer space

Distance from flagger to work space

Flagger visibility

Posted Speed (mph)	Length (feet)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
Distances should be increased for steep grades, slippery pavement, and heavy trucks.	

Flagger Stations (cont.)

TO STOP TRAFFIC:

The flagger shall face traffic and aim the STOP paddle face toward traffic in a stationary position with arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.



Flagger Stations (cont.)

TO DIRECT STOPPED TRAFFIC TO PROCEED:

The flagger shall face traffic with the SLOW paddle face aimed toward traffic in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for traffic to proceed.



TO ALERT OR SLOW TRAFFIC:

The flagger shall face traffic with the SLOW paddle face aimed toward traffic in a stationary position with the arm extended horizontally away from the body.



Flagger Stations (cont.)

Red Flag Use

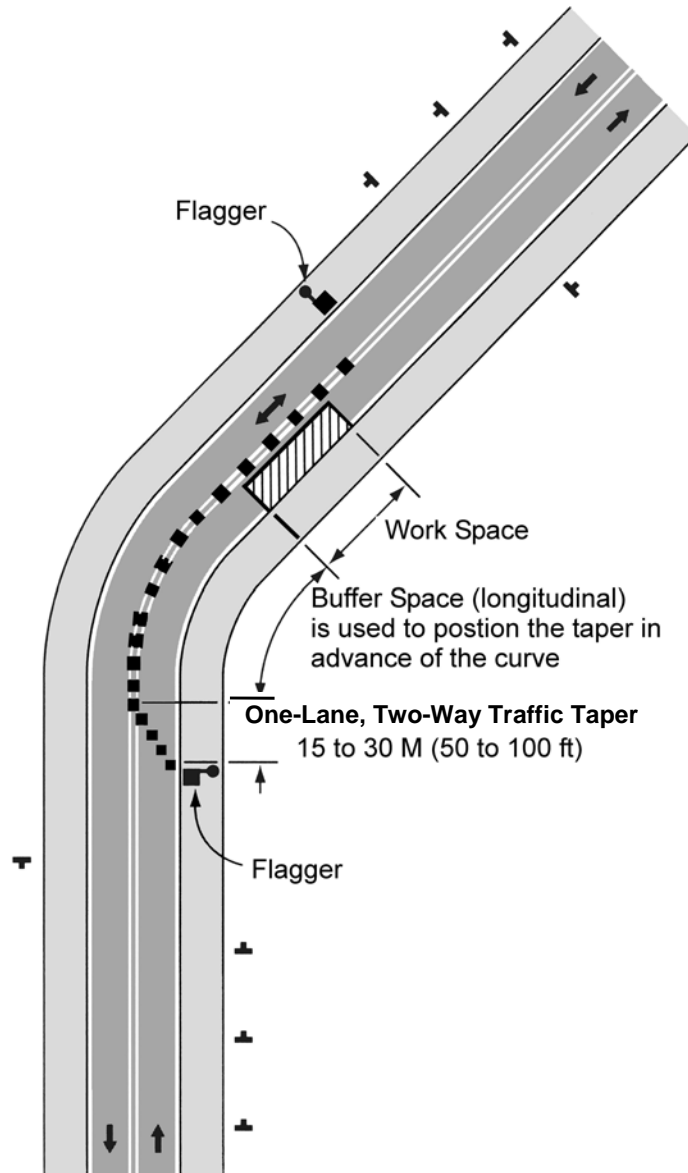
STOP/SLOW paddles are the preferred signaling devices however advance flaggers may use an approved red flag.

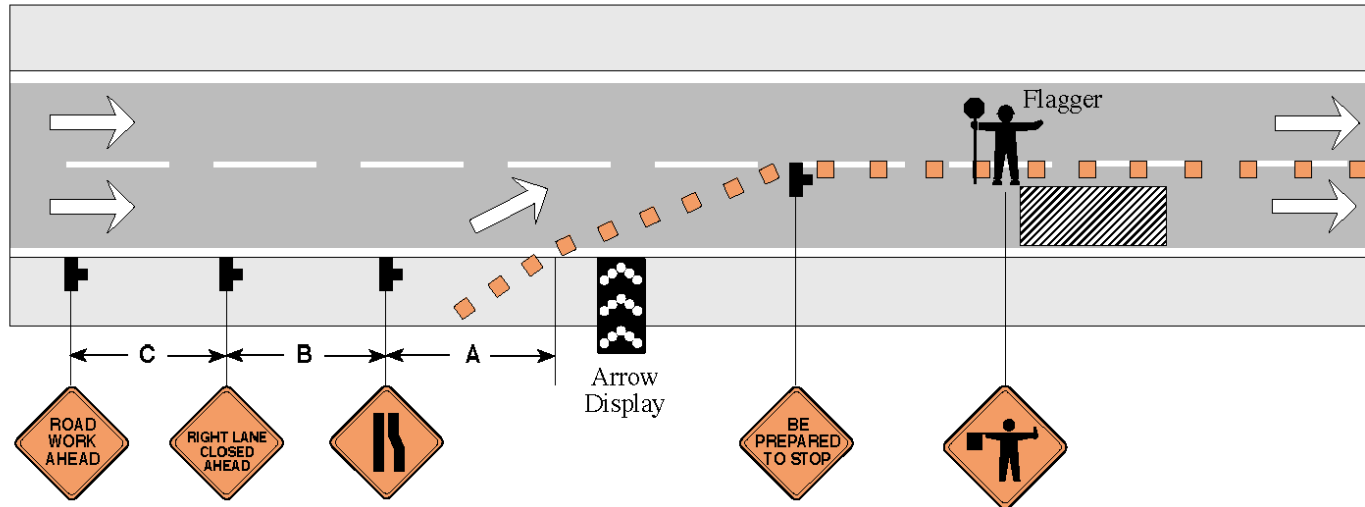
Advance flaggers are not allowed to stop vehicles only alert & slow them.

To ALERT or SLOW Traffic:

To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down, without raising the arm above a horizontal position. The flagger shall keep the free hand down.







One-way Traffic Control - Using one flagger















Flaggers Rules of Conduct

- **Be clearly visible to approaching traffic at all times.**
- **Motorists should be able to see you from 500 feet away.**
- **Do not stand in front of parked/stopped vehicles.**
- **Always be aware of oncoming traffic.**
- **Do not step into, or turn your back on traffic.**
- **Stand on the shoulder of the road observing traffic and the work zone. Sometimes you may have to stand on the opposite side of the road to effectively direct traffic around the work area.**

Flaggers Rules of Conduct

- Chose the best flagging position that will provide the greatest color contrast between you and the background.
 - If at all possible, do not stand in the shade.
 - Never flag from inside a vehicle.
 - Do not lean, sit or lie on a vehicle.
 - Stand alone. Do not permit a group of workers to congregate around you.
 - Familiarize yourself with the nature of the work being performed. Be able to answer motorists' questions.
 - Establish a warning signal with the work crew in case of an emergency.
-

Flaggers Rules of Conduct

- **Plan an escape route in case of an emergency.**
 - **Stay alert! Be ready to respond to an emergency.**
 - **Record the license number and description of any vehicle whose driver disobeys your instructions and threatens the safety of the work area. Report information to authorities.**
 - **Be courteous and professional.**
 - **Keep your mind on your job. Be aware of the work in progress.**
-

Flaggers Rules of Conduct

- **Do not do any other work when flagging.**
 - **Do not use cell phones or pagers while performing flagger duties.**
 - **Do not involve yourself in unnecessary conversation with workers, pedestrians, or motorists.**
 - **Do not leave your position until you are appropriately relieved.**
 - **Cover, turn or remove the “FLAGGER AHEAD” sign when a flagger is no longer on duty,**
 - **Always carry your flagger certification card while on the job.**
-

Equipment and Clothing

Equipment

Standard specification for the STOP/SLOW paddle are as follows:

- **Octagonal shape**
 - **18 inches minimum width, with letters at least 6 inches high (24” for WSDOT projects).**
 - **Equipped with a rigid handle.**
 - **Fabricated from light, semi-rigid material.**
 - **The background of the STOP face shall be red with white letters and border.**
 - **The background of the SLOW face shall be orange with black letter and border.**
 - **The STOP/SLOW paddle shall be fabricated using encapsulated lens reflective sheeting or brighter.**
-

Oregon - Equipment and Clothing (cont.)

Flaggers should always be appropriately dressed.

- **Flaggers shall be equipped with a retroflective vest which is:**
 - **Orange, yellow, strong yellow-green or fluorescent versions of these colors.**
 - **Retroreflective material shall be orange, yellow, white, silver, or strong yellow-green, and be visible at a minimum distance of 1,000 feet.**
 - **Retroreflective clothing shall be designed to identify the flagger as a person and be visible through the full range of body motions.**
 - **A fluorescent yellow-green, orange, yellow, or bright white hard hard or baseball-style cap shall be worn. When there is danger of falling or flying objects or electrical shock or burns, a hard hat shall be worn.**
-

Washington - Equipment and Clothing (cont.)

■ Daytime Flagging

- **Class 2 retro-reflective vest (fluorescent yellow-green, fluorescent orange-red or fluorescent red in color – 360 degree visibility)**
- **Hi-Viz hard hat (white, yellow, yellow-green, orange or red in color)**

■ Nighttime Flagging

- **Class 2 retro-reflective vest**
 - **White pant – unless fog**
 - **Hi-Viz hard hat w/retoreflective tape**
-

WAC 296-155-305, Signaling and Flaggers

“This Washington Administrative Code applies to all employees flagging traffic in Washington State.”

CHAPTER 9

INSTALLING AND REMOVING TRAFFIC CONTROL DEVICES

Preparation for Installation

Installation and removal of temporary traffic control zones create situations that are often far more hazardous because:

- **Workers must be in the roadway, and**
- **The placement operation constitutes an unexpected situation for motorists.**

Preparation for Installation, cont...

To reduce the exposure, the installation should be done as quickly as possible.

Preparation for Installation, cont...

Coordination with Affected Groups

- **Planned activities and start times should be coordinated with all affected organizations and groups.**

Preparation for Installation, cont....

Planning the Installation:

- **Analysis of special requirements greatly improves the safety and efficiency of the installation.**
- **A visit to the site is necessary.**

Preparation for Installation, cont....

Inventory and Storage:

- **A complete inventory, listing all required traffic control devices and equipment for all phases of the operation should be prepared.**

Preparation for Installation, cont....

- **Devices maintained in inventory need to be formally organized.**
- **Traffic Control Devices need to be stored properly.**

Preparation for Installation, cont....

- **Mechanical and electrical elements and equipment require routine maintenance.**

Preparation for Installation, cont....

Training and Instruction:

- **All crew members should be trained for their tasks, with particular emphasis on safety.**
- **Crews should be cautioned to always face oncoming traffic.**

Installation

Installation Sequence:

- **Devices are installed in the direction that traffic moves.**

Installation, cont....

- **When one direction of traffic will be directed into opposing traffic lanes, signs, channelizing devices, and pavement markings for the opposing traffic should be placed first.**

Installation, cont...

- **The installation and removal sequence for detours are the opposite of those described earlier.**

Installation, cont....

- **Use flashing vehicle lights and special lighting devices to warn motorists of the presence of workers.**

Installation, cont....

Installation Procedures:

- **Work vehicles should be parked in a safe location.**
- **The work vehicle may serve as the advance warning device by using its flashing/rotating lights.**
- **On high speed roads, a “shadow” and/or “protection” vehicle should be used.**

Installation, cont....

Placing Channelizing Devices:

- **Devices should be moved out from the shoulder with the worker looking toward traffic.**

Installation, cont....

Cone Placement:

- **Cones may be placed either by workers on foot or from a moving vehicle.**
- **When working from a vehicle, the truck should be equipped with an approved worker platform and railing.**



10-PIC1





10-PIC3

Removal

Removal Sequence:

- **Temporary traffic control zones should be removed by picking up the devices in the reverse sequence to that used for installation.**



Removal, cont....

MUTCD 2003

“All temporary traffic control devices shall be removed as soon as practical when they are no longer needed.”

Removal, cont....

MUTCD 2003

“When work is suspended for short periods of time, temporary traffic control devices that are no longer appropriate shall be removed or covered.”



10-PIC8



10-PIC9





10-PIC11